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ABSTRACT

Energy activities and lesson plans for kindergarten and grades 1 to 3 (grouped into seven units representing seven major conceptual schemes) are provided in this teachers' guide, with a unit at each grade level for each conceptual scheme. Conceptual schemes addressed include: (1) energy is the ability to do work; (2) energy comes from the sun; (3) energy can be changed from one form to another; (4) the sun is the earth's chief source of radiant energy; (5) people use energy to satisfy their needs; (6) energy supplies are limited; and (7) living things are interdependent with one another and with their environment. Each unit includes a pre-/post-test evaluation instrument, lesson plans, and supplemental activities. Lesson plans consist of a specific energy concept, objective, and instructional strategies for introducing, developing, and extending the lesson. Purpose, materials, and procedures are provided for each of the supplemental student activities. The guide begins with a brief introduction to teachers and statement of the energy policy for Florida and concludes with a list of key vocabulary words (Enerwords), bibliography, sources of energy information and teaching materials, and an evaluation sheet. (JN)

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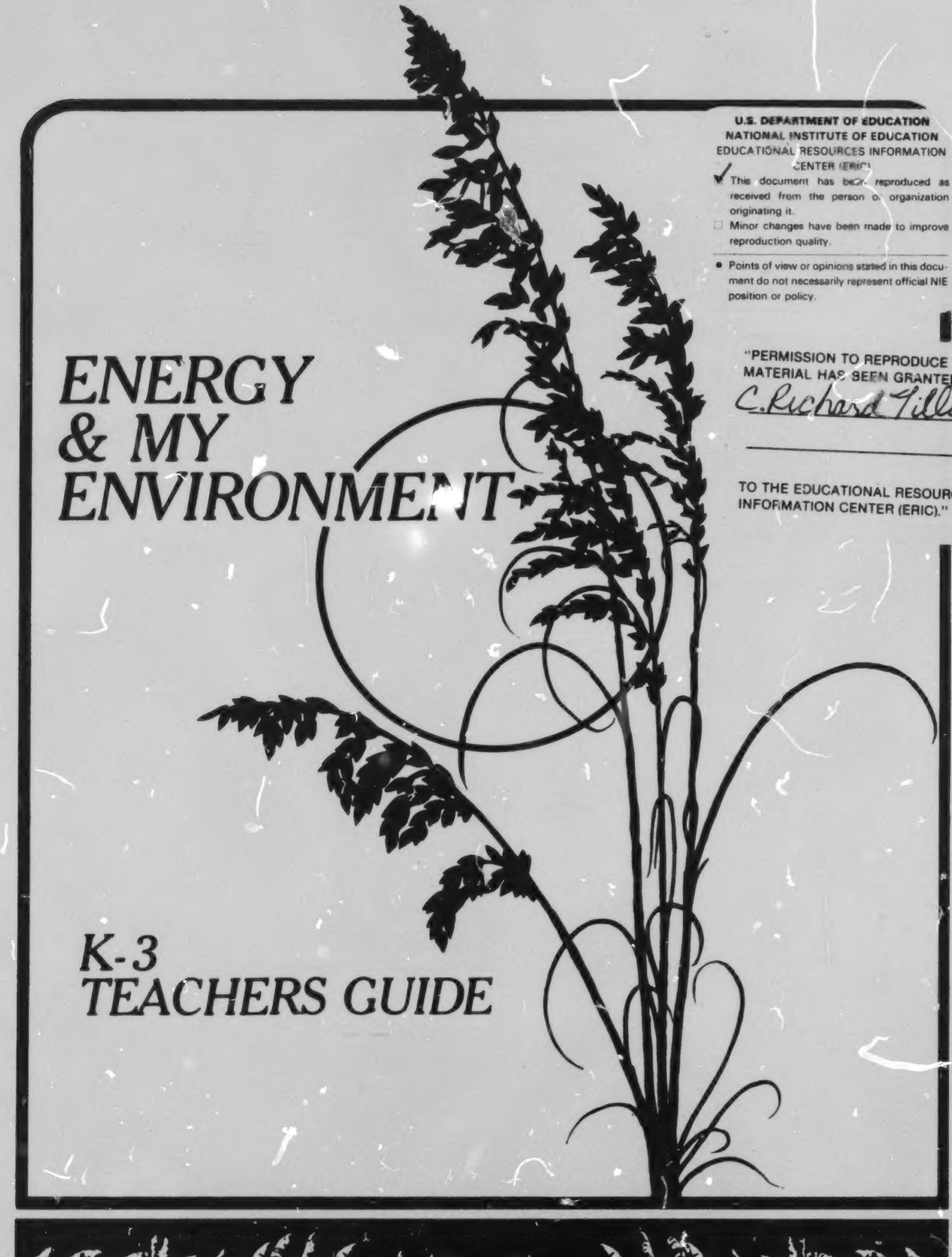

ENERGY & MY ENVIRONMENT

K-3 TEACHERS GUIDE

Governor's Energy Office / State of Florida

SAVE IT, FLORIDA.

3 SE 038 814

ENERGY AND MY ENVIRONMENT

TEACHERS' GUIDE
FOR
KINDERGARTEN, GRADE ONE, GRADE TWO, GRADE THREE

Written by:
Matthew J. Brennan, Ph.D.

Series Editors:

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June 1982

Governor's Energy Office
State of Florida

We are all parts of a great Web of Life - -
Powered by the Sun - -
All interdependent with the others.....

John H. Storer
1938

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* Detailed listing of the Units and Lessons for each grade level appear at the beginning of each grade-level section.

FOREWORD

This Kindergarten through Grade Three teachers' guide is the first of a series entitled ENERGY AND MY ENVIRONMENT. Other volumes of this series are:

ENERGY AND MY ENVIRONMENT, 4 - 6 Teachers Guide
ENERGY AND MY ENVIRONMENT, 6 - 8 Teachers Guide
ENERGY AND MY ENVIRONMENT, 9 - 10 Teachers Guide
ENERGY AND MY ENVIRONMENT, 11 - 12 Teachers Guide

After participating in many curriculum development and educational planning projects, the editors recognized one element permeating those that were most successful. That element is the establishment of major ideas that serve as recurring themes throughout the child's educational experiences. This publication is designed to integrate key energy and energy conservation ideas in just such a manner.

The State of Florida was most fortunate in obtaining the services of Dr. Matthew J. Brennan as the author of this series of teachers' guides. His work as editor on the PEOPLE AND THEIR ENVIRONMENT series established him as one of the founders and principal practitioners of this cognitive theme approach.

Through the Tri-County Teacher Education Center, Sebring, Florida, teachers were employed to select supplemental activities to accompany the lessons prepared by Dr. Brennan. Funds for this activity were provided through the mini-grant program of the Office of Energy and Environmental Education, Florida Department of Education.

These materials are designed to provide the flexibility any good teacher demands, while also providing the recurring themes that may well be essential if the lessons are to have any lasting impact on the student. These materials can play an important role in the development of a citizenry that thinks and acts on a basis of factual knowledge of key energy concepts and also possesses an understanding of the great national and international web of energy relationships and interdependencies important for the citizen of today and essential for the citizens of the future.

The editors wish to thank the dedicated educators who have contributed their time and expertise to make this series, ENERGY AND MY ENVIRONMENT, available to the teachers in Florida's schools. A special thank you goes to secretaries Edie Boynton and Patricia Patrick for the long hours spent preparing these manuscripts for printing, and to Mary Lou Stursa and Dr. Rodney Allen for their expert assistance.

The Editors

INTRODUCTION - TO THE TEACHER

Is there an "energy crisis"? There has always been an energy crisis, as humans struggled to survive on planet earth. Now we face a new energy crisis - a crisis related to the future supply of the fossil fuels on which our civilization depends. This new energy crisis provides unlimited possibilities for student activities that will help children learn about the earth and how the use of energy has shaped civilizations of the past and present, as well as how it will determine the civilizations of the future.

Through their use of energy, humans have radically changed the environment. Now we must face the consequences of these changes, not only on the environment, but on all of life, including our own; on our societies; our economies; on the air we breathe and the water we drink; on the lifestyles we lead; on the quality of the environment; and on the lives of the animals with whom we share the earth. The changes were made by people. The problems they have created can only be solved by people - indeed, by people who wish to solve them.

So we have reached the "crisis." The fossil fuels, which gave us unlimited supplies of cheap energy, are being rapidly depleted. The time for decision has arrived. How will we answer? We have the technology to solve most of the energy-related problems of the earth environment. Whether we solve these problems will depend on how clearly they are recognized and whether our values will demand their solution. It is hoped that the activities in this guide will help students to understand the scientific, social, and aesthetic alternatives that must be considered.

The activities have been organized around the seven major conceptual schemes relating to energy, with a Unit at each grade level for each one of the conceptual schemes. In addition, there is a lesson concept for each lesson to help the teacher coordinate the activities with other areas of the curriculum. Each lesson is designed to suggest some activity, with the emphasis on "suggest", because students will be free to interpret each activity suggestion as they will.

You will have many ideas for variation and improvement of the lessons suggested. Future revisions of this guide will better serve the needs of teachers in this rapidly changing area of education.

PLEASE RETURN THE REVIEW SHEETS LOCATED IN THE BACK OF THIS BOOK. IT IS NECESSARY THAT WE HAVE INFORMATION FROM YOU FOR EVALUATION PURPOSES.

ENERGY POLICY FOR FLORIDA

WHEREAS, energy availability strongly impacts upon every aspect of human existence and the conservation of energy resources is essential to the health, safety, and welfare of the people of this state and to the well-being of the state economy, and

WHEREAS, Florida is particularly dependent upon other states and nations to supply its energy needs, and

WHEREAS, the majority of Florida's energy requirements are obtained from petroleum and natural gas, and the supply of these fuels is subject to interruption, and

WHEREAS, wasteful, inefficient, uneconomic, and unnecessary use of energy will result in a serious depletion of energy resources and represents a potential threat to preserving the health, safety, and welfare of the people of Florida, and

WHEREAS, alternative sources of energy are years from being fully developed and there is a pressing need to accelerate research and development of these sources, and

WHEREAS, energy conservation represents a meaningful, immediate, and appropriate state response to the energy problem by eliminating waste and inefficiency and increasing economic productivity, by reducing the depletion of our domestic energy resources which, in turn, increases economic flexibility of the people of Florida, and by decreasing the pressure to develop marginally efficient methods of energy production and thereby reducing the flow of capital from the non-energy sections of the economy and avoiding serious impacts on our environment. NOW, THEREFORE, BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF FLORIDA:

IT SHALL BE THE POLICY OF THE STATE OF FLORIDA TO:

1. Develop and promote the effective use of energy in the state and discourage all forms of energy waste.
2. Play a leading role in developing and instituting energy management programs aimed at promoting energy conservation.
3. Include energy considerations in all planning.
4. Utilize and manage effectively energy resources used within state agencies.
5. Encourage local governments to include energy considerations in all planning and to support their work in promoting energy management programs.
6. Include the full participation of citizens in the development and implementation of energy programs.

7. Consider in its decisions the energy needs of each economic sector, including residential, industrial, commercial, agricultural, and governmental uses.

8. Promote energy education and the public dissemination of information on energy and its environmental, economic and social impact.

9. Encourage the research, development, demonstration, and application of alternative energy resources, particularly renewable energy resources.

10. Consider in its decision making the social, economic, and environmental impacts of energy-related activities, so that detrimental effects of these activities are understood and minimized.

11. Develop and maintain energy emergency preparedness plans to minimize the effects within Florida of an energy shortage.

(Chapter 377.601, Florida Statutes)

KINDERGARTEN

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ENERGY TEST - KINDERGARTEN

A Pre-test and Post-test Evaluation Instrument

1. List 5 sounds made when energy is used. (singing, car moving, wind, lawn mower, music)
2. How does a sweater keep you warm? (holds child heat in)
3. List 5 ways energy is used to make something move. (push, pull, lift, talk, move, scratch, rub, blink, etc.)
4. List things in which energy can be stored. (battery, food, fuel)
5. How is a child like a hot water pipe? (give off heat, warm)
6. How do hot things cool off? (lose heat to air)
7. How can children enjoy the sun? (sunbath, heat, light, pretty)
8. What is light? (a kind of energy)
9. Why do children need energy? (food, heat, light, cook, TV)
10. Why should children eat a good breakfast? (energy)
11. Why do children get tired? (use up their energy)
12. List some people we depend on for our energy. (farmer, oil truck driver, miner, gas man, electrician)

Title: Listen For Energy Being Used

Concept: Energy is the ability to do work.

Objective: To discover the relationship between work and energy being used and to see that energy is required to make something move

Introducing the lesson:

1. Make a series of sounds. Rap on a glass with a ruler; blow on a whistle or pitch pipe; let the air out of a balloon; snip some scissors; stamp your foot; drop a pencil; move a chair; do anything that will make a noise or a pleasant sound (play a record). Ask the children to tell you how you made each sound (hit the glass; blew the whistle or pitch pipe; hit the floor with your foot; hit the floor with a pencil; dragged the chair; plucked a string, etc. (You moved something.)

2. Listen quietly to your watch. Ask: Why is it hard to hear my watch tick? (It is a quiet sound, not loud like the sounds you made.) Say: Some things move quietly so we have to listen carefully to hear them. But they are still moving. They are still making a sound. They are still using energy.

3. Now listen quietly for a few minutes for other sounds of things moving and making noise or pretty sounds.

Developing the lesson

Walk down the street and listen for energy being used.

1. Let's make a list of what you heard.
   a. List all the things they mention.
   b. To add to their list, ask: How many heard...a child talking; moving; the wind; leaves moving; a bird singing; another animal; a car; a truck; an airplane; a lawnmower? You will be able to make your own list if you listen for outdoor sounds during the quiet listening time.

2. Say: Let's see if we can see what made the sounds you heard. Ask: What made the sound? What was being done? Was the thing that made the sound moving? Was it using energy? What kind? (gasoline, bird power, child power, wind power, etc.).

Extending the lesson:

1. Move like the thing that made the noise. (Move like the wind, the car, the plane, the whatever.)
2. Listen for energy sounds at home. Make a list of home energy sounds the children heard and what made each sound.
3. Find something that uses energy without sound (electricity; flip a light switch).
4. Use the other senses to find energy being used (smell, touch).

Evaluation:

Have the children tell a story about the sounds of energy being used to move something.

Title: A Friend Uses Energy

Concept: Energy is used to make things move.

Objective: To discover the relationship between work and energy use; to show that energy is required to make things move

Introducing the lesson:

1. Divide the class into pairs of children. Each pair will have one player and one watcher.
2. For ten minutes, one child from each pair will play while the other watches energy being used - in this case, child energy. You may help the watchers record their findings with a key word on a paper.
3. Now reverse the roles of the children.

Developing the lesson:

1. Make a list of the things they saw their partners do.
2. Add to their list by asking: Did anyone see: a push; a pull; a lift; a move; a scratching; a rubbing of a nose; an eye move; an arm lifted; a sound made, etc.?
3. Draw a picture of a friend using energy.
4. Do a movement to show how a friend uses energy.

Extending the lesson:

1. Tell the story of your picture.
2. Repeat your movement over and over to make a dance.

Evaluation:

Ask the children to tell a short story about how their friend used energy to move something.

Title: Two Ways To Keep Warm

Concept: Heat is a form of energy.

Objective: To discover that heat is a form of energy; when energy is used, heat is given off

Introducing the lesson:

This lesson is best done on a cold day when sweaters and jackets are worn.

1. Ask: Why did you wear a sweater today? (To keep warm)
2. Ask: How does a sweater keep you warm? (Holds body heat in.) At this point you are introducing the concept of insulation.

Developing the lesson:

1. Do a study of how the body gives off heat if it is not covered. Feel your partner's forehead, neck, arms.
2. Ask: How do they feel? (Hot or Warm)
3. Now feel a shoulder or an arm covered by a sweater. Ask: How do they feel? (Cool)
4. Ask: Is the sweater warm? (No)
5. Ask: What does the sweater do? (Holds the body heat in)
6. Ask: Where did the heat in your body come from? (The energy in the food they ate)

Extending the lesson:

1. Ask: What would happen if we took off all our sweaters? (We would get cold)
2. Ask: Is there any other way we could keep warm if we took off all our sweaters? (Heat the room more)
3. Ask: Which way of keeping warm is better? (Here, you will find different opinions based on different values)
4. Ask: Which way uses less energy? (Sweater)

Evaluation:

1. Draw a picture of yourself or a friend keeping warm on a cold day.
2. Show in any other way you wish that there are two ways to keep warm.

Title: Energy You Can Touch

Concept: Energy comes in many forms.

Objective: To recognize that there are several kinds of energy and to see that some energy can be stored (chemical)

Introducing the lesson:

1. Open a bag of jelly beans or other small bits of candy (or cereal or peanuts) and give each child one. Ask: What kind of energy can we get from this candy (or cereal) when we eat it? (heat, energy to move)
2. Draw a picture of energy you can touch.
3. Describe your picture.

Developing the lesson:

1. Ask: How many kinds of energy do we have shown in our pictures?
2. Ask: How many of you can describe your picture in another way... without words... by movement?
3. Ask: What kind of energy should we not touch? (electricity, heat that is too hot)
4. Ask: Is energy stored in the candy? Nut? Cereal?
5. Ask: What do we call this kind of energy? (food)

Extending the lesson:

1. You may wish to ask if there are other kinds of stored energy. (battery - stored electricity)
2. Make a list of things in which energy can be stored.
3. Draw a picture showing energy being stored.

Title: Move Some Energy

Concept: Energy can be changed from one form to another.

Objective: To give children the opportunity to discover that energy can be moved from place to place

Introducing the lesson:

1. Start the lesson by asking: How is a child like a hot water pipe? (both have heat inside; both give off heat to the air - both are radiators)
2. Ask: How does the heat get out of the pipe? (the pipe gives off heat to the air)

Developing the lesson:

1. Have one of the children jump up and down until he or she feels hot. If it is a hot day they may even sweat.
2. Have other children describe what is happening to the heat in the child's body. Ask: Can you feel heat coming from (name)?
3. Ask: Where did this heat come from? (food)
4. Explain that the energy in food was first changed into the energy for jumping up and down and then into heat which was given off.
5. Ask: Is a child like a hot water pipe? (YES!)

Extending the lesson:

1. Draw a picture showing what happened to the food energy used for jumping. Be sure to ask what happened to the heat given off. (it was lost in the air)
2. Ask the children how they might keep a hot water pipe from losing its heat to the air. (insulate it; wrap it with a "sweater")
3. Ask: What other kinds of stored energy can be changed to something else? (battery = electrical; gasoline in a car = motion and heat)
4. Take a trip out on the school grounds near a road and watch for energy being moved. (What is in the trucks? oil, food, etc.)

Title: Warm Something

Concept: Energy can be passed from one thing to another (heat transfer).

Objective: To give children the opportunity to discover that heat can be passed from one thing to another

Introducing the lesson:

Take the children out on the school grounds (a sidewalk or asphalt court is just as good). Ask them to find ways that heat moves from one place to another. (Keep a list as they report to you.) Ask them to bring some heat back with them (warm stone, etc.).

Developing the lesson:

1. Transfer the class list of ways heat moves to the chalkboard.
2. Now make a list of the ways the children used to bring heat into the classroom.
3. Watch the "heat" items until they have cooled. Ask: What happened to the heat in the ________? (It went out into the air and was lost - just like the hot water pipe or pot).
4. Ask: Where did the heat in the ________ come from? (the sun) Say: Let's go out and see if we can heat them again.

Extending the lesson:

1. Ask the children to warm the objects in another way besides the sun. (holding them)
2. Ask: Could you cool something by holding it or by putting it in the room? (Yes - by holding something hotter)
3. Ask: Where does the heat go? (the air)

KINDERGARTEN, UNIT IV, LESSON 1

Title: Enjoy the Sun's Energy

Concept: We get energy from the sun.

Objective: To give children the opportunity to discover the effects on humans of the radiant energy from the sun

Introducing the lesson:

1. Go outside the school to enjoy the sun's energy - say "hello" to the sun. (sunrise, sunset, heat)
2. Sit in the sun for a little while and make a list of the ways you can enjoy the sun. (heat, light, plants, animals, the wind)

Developing the lesson:

1. Although the process will not be understood (that is not necessary now) explain that the sun helps green plants to make and store our food.
2. Draw a picture which shows a "sun farmer" using the sun to grow plants.
3. Say to the "Sun Farmer": Thank you for our food!
4. Think sun! Think of what the sun does for you - think of fire, heat, light, beauty, sunsets.

Extending the lesson:

1. Ask the children to look on the boxes of food in their homes for pictures of the sun making the food (cereal, etc.) and bring in the empty boxes.
2. Make a collage of the sun's energy being used by plants to make food using the children's pictures from food boxes.
3. Have the children do a dance to show how they enjoy the sun's energy.

Title: "Feel" The Light Of The Sun

Concept: We get light from the sun.

Objective: To give children the opportunity to discover that we get light from the sun

Introducing the lesson:

1. Go outside and sit in the sun. Ask the children to feel the light of the sun reach into them. (Explain that light is another kind of energy from the sun in addition to heat.)

Developing the lesson:

1. Ask the children to tell how they enjoy the light from the sun.

2. Ask: How is the light different from the dark? (It is dark when there is no light; we can't see.)

3. Ask: What do we do when it is dark? (We use another kind of energy to light things - electricity.)

Extending the lesson:

1. Ask the children to make up a story about their energy reaching out to the sun.

2. Ask: Do all living things like the sunlight as much as you do? (No. Some animals come out only at night. Others live in dark caves and tunnels.)

3. Draw a picture of yourself enjoying the sun's energy.

4. Listen to the record or sing "Theme from Aquarius".

Title: My Energy Needs

Concept: People use energy to satisfy their needs.

Objective: To discover how we use energy to supply our needs

Introducing the lesson:

1. Have the children make a list of all the things they need and the energy they use. (Be sure they have listed food, clothing, shelter and transportation.)

Developing the lesson:

1. For each item on the class list of energy needs, decide if it is really needed in order to live or if it is something that we could get along without. (Only food, clothing, transportation and shelter are needed. Others are things we do not need but want.)

2. Ask: What do we need each one for? (food to warm and move the body; clothing and shelter to protect us; transportation to move us, and the goods we need, from one place to another.)

Extending the lesson:

1. Now make a list of other things they use at home or in school that they could get along without. (TV, radio, candy, sugar, electric appliances.)

2. Ask the children what they would have if they could have anything they dreamed of?

3. Ask them to draw a picture of them in their dream world.

Evaluation:

1. Look at some of the dream world pictures. Ask the children what kinds of energy the dream worlds would need to make them "go".

2. Ask these questions:

   a. Are there things we can get without spending money? (yes) Have children name some things.

   b. Are there things we can get without spending energy? (No) Discuss why not.

Title: Do Something You Like -- Change Something

Concept: People use energy to do things.

Objective: To discover that children use energy to do things

Introducing the lesson:

1. Ask the children to use energy to do something. (Let them be creative. You must be patient. Do not give them any ideas. They will turn on a light, move something, dance, sing, talk.)

2. Make a list of the things children use energy for.

Developing the lesson:

1. Try to classify the things the children did into kinds of energy.

    a. How many used energy to heat something?
    b. How many used energy to light something?
    c. How many used energy to move something?
    d. How many used energy to grow?
    e. How many used energy that was stored?

2. Use energy to change something they do not like to something they like.

Extending the lesson:

1. Ask the children how they decided what they would use energy to change. (values)

2. Ask the children to observe the difference between their use of energy and the use of energy by their parents or grandparents. (Older people do not grow, play, etc. as much and therefore do not need as much energy.) Ask: Are old people always hungry like you are? Do they run as much?

3. Ask: Does a candy bar give you lots of energy?

4. Ask: How do you know when a friend has lots of energy?

5. Ask them to try to change back the object they changed earlier in this lesson to the state it was in originally. (The heat lost in the change is lost forever. A new supply of energy will be needed. Some changes cannot be changed back - growth, for example.)

Title: Let's Share Some Energy

Concept: Energy supplies are limited and must be shared.

Objective: To discover that energy supplies are limited and must be shared by all (Scarcity)

Introducing the lesson:

1. At the beginning of the lesson, open a bag of jelly beans or peanuts and start passing them out. Be sure that there are fewer pieces of candy than there are class members. (Later you can give a piece to those who were left out.)
2. Say: Now you have seen a shortage of energy; there was not enough energy to go around. Ask: If the jelly beans were all we had to eat, how would we decide to divide them? Who would get the food? (first ones, biggest, strongest, best student, one who was hungriest, one who cried?)

   Note: Now that the concept of scarcity has been introduced, you can give a piece of candy to those who didn't get one at first.

Developing the lesson:

1. Ask: What if I had cut the jelly beans in half? Would we have had a piece for everyone? (Yes, but each would would have had less.)
2. Ask: Do you need energy to work? (Yes)
3. Ask: If you don't have food, can you work? (Not for long)
4. Ask: Should you eat a good breakfast so that you can do your school work? (Yes)
5. Find some pictures in a magazine of children who are hungry. Ask: What kind of energy is scarce? (food)
6. Ask: What other kinds of energy might be scarce? (gasoline, wood)
7. Ask: What kinds of energy might never be scarce? (Sun)

Extending the lesson:

1. Have the children draw pictures showing too many people and not enough food.
2. Have them write or tell a story about their pictures.

Title: Getting Tired

Concept: Energy supplies are limited.

Objective: To have the children discover that the energy in their bodies is limited

Introducing the lesson:

This lesson should be done after play period.

1. Ask: Who is tired from all our exercise? (everyone will be tired)
2. Ask: What energy supplies are limited or scarce? (body energy)
3. Ask: Where did our body energy go? (into movement which made us hot; the heat went into the air)
4. Ask: How can we get a new supply of energy? (eat, drink)

Developing the lesson:

1. Show pictures of people who have used up all their energy. (tired laborers, athletes, etc.)
2. Ask: How can all these people get a new supply of energy? (eat, drink)
3. Ask: Who would get tired first, someone who had plenty of food or someone who was hungry?
4. Make a bulletin board display of tired people.

Extending the lesson:

1. Do a movement which shows how you feel when you are tired.
2. Teach it to a friend. Then you will have made a "Tired Dance".
3. Now show how the dance would go if you had some food and a little rest.
4. Ask: Do you think you could get along with a little less food so that some hungry children might have more?
5. Make a list of what we could give up without losing all our moving energy. (This is a good way to start developing the distinction between what they need and things they could do without - or would be better without.

KINDERGARTEN, UNIT VII, LESSON 1

Title: My Environment Supplies Energy

Concept: We depend on the environment for our energy.

Objective: To give children the opportunity to discover their dependence on their environment for their energy - to discover where their energy comes from

Introducing the lesson:

1. Review (or make a new) list of all the kinds of energy used by the children in the class.
2. For each kind of energy on the list, try to find out where it comes from. (For example, we get heat energy from oil, gas, electricity, sun. We get food energy from farms.)

Developing the Lesson:

1. For each item on the class list, have the children try to trace the energy back to where it came from. (For example, oil from the ground)
2. Do a special list to show where different kinds of food come from. (fruit - trees; cereal - soil; fish - water; meat - animals; milk - animals. All come from the environment.)

Extending the lesson:

1. Have the children draw a picture showing where the energy they use comes from. (soil, water, air, plants, animals, rocks) Be sure they show the energy from the sun.
2. Have them explain their pictures to the rest of the class.
3. Ask: Where does your energy come from? (My environment.)

Title: I Depend On Others For My Energy

Concept: We depend on others for our energy needs.

Objective: To give children the opportunity to discover that many other people are needed to supply their energy needs.

Introducing the lesson:

This lesson should be done following the preceding lesson "My Environment Supplies Energy".

1. Make a list of all the kinds of energy the children use. (Be sure they have included food, heating, lighting, appliances, electricity, sun, gasoline.)
2. For each item on the list, add for what the energy is used.

Developing the lesson:

1. For each item on the list, try to find out how the energy is brought to their school or home. (wire, truck, child carried)
2. Draw a picture showing how energy is brought to your school.
3. Tell the story of your picture to the class.

Extending the lesson:

1. List all the kinds of people you depend on for your energy. (farmers, miners, oilmen, truckers, power plant workers, loggers, cooks, food packagers, sailors, dock workers, etc.)
2. Ask: Where did our energy come from? Investigate the places where energy for your use came from. (addresses on candy wrappers and food packages. Arabia, Venezuela, Texas, Louisiana, sun, etc.)
3. Ask: How do others depend on you for energy? (share food, heat, light)
4. Ask: How does a teacher use his/her energy to help his/her students?
5. Ask: How do students use their energy to help the teacher?
6. Ask: What do you call it when everyone depends on everyone else? (IN-TER-DE-PEN-DENCE)
7. Ask: What other energy words have we learned?
8. Make an energy word list and repeat the words over and over.

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ENERGY TEST - GRADE 1

A Pre-test and Post-test Evaluation Instrument

1. List 5 things that need energy to move. (clock, train, car, children, animals)
2. List 3 ways to keep warm. (clothes, jump, sit by a heater)
3. What kind of energy can be put in a bag? (food, candy, battery)
4. What kind of energy cannot be put in a bag? (oil, gas)
5. How do people use the energy of the wind? (sail, windmill)
6. How do plants use the energy of the wind? (move seeds)
7. What kinds of energy do we get from the sun? (heat, light)
8. How do we use energy in school? (heat, light, cooking, TV)
9. How is energy used to change things? (earth mover, holes dug, houses built, water boiled, food cooked)
10. What does "scarce" mean? (there is not enough to go around)
11. How is a wild animal like a child? (both need energy to move and grow)
12. List 3 ways we can save energy in our classroom. (turn off lights, open windows on hot days, wear a sweater on cold days)

Title: Body Language

Concept: Energy is used to make things move.

Objective: To have the children discover that energy is used to make things move - that they can use body energy to send a message

Introducing the lesson:

1. At the start of class, try to use body language rather than speaking to send messages to the children. (be quiet, listen to me, be happy, be angry)
2. After a short time, ask the children if they can send a message to you using body language. (raise a hand, watch me, listen, be happy)

Developing the lesson:

1. Ask the children to use their bodies to demonstrate:
   - a. sunlight (shining)
   - b. electricity (pulsing, flowing)
   - c. coal being mined (shoveling, pushing cart)
   - d. oil being spilled (flowing)
   - e. heat moving (waves)
   - f. light coming through a crack
   - g. energy changing
   - h. a story they would like to tell (pantomime)

Extending the lesson:

1. Ask the children to:
   - a. draw one of the movements they made
   - b. do a body movement without using energy (they can't; even deciding not to move requires nerve energy)
2. Go outside along a street and watch for ways people use body energy to send a message.
   - a. watch them gesture as the talk
   - b. look for body signals (ready, turn, etc.)
3. Ask the children to show what they saw without talking.

Title: Move An Object

Concept: Energy must be used to put an object in motion.

Objective: To discover the relationship between energy and motion - to see that energy is required to make something move

Introducing the lesson:

Use an unwound clock or watch, or an electric clock which is not plugged into an electrical outlet.

1. Ask the children to watch the clock, to listen for the tick. They will soon see that the clock is not running.
2. Ask the children to suggest why the clock is not running. (not wound, not plugged in, broken...)
3. Ask the children how they can check each of their suggestions.
4. Let the child who made the correct suggestion wind the clock or plug it in. Then watch or listen again.
5. Ask why the clock is now running. (It is now wound or plugged in)

Developing the lesson:

Develop with the class a list of other things that need energy to move. (toys, trains, car, animals)

1. Ask the children to bring in some of their favorite windup toys.
2. Let the children tell of their experiences with their toys.
3. Ask:
    a. Why do you have to wind the toy? (it has a spring)
    b. Did you use energy to wind the toy?
    c. How is energy stored in the toy? (You may be able to show the children the spring in a broken toy or watch with the back removed.)
    d. Would the key alone make the toy move?
    e. Would the spring alone make the toy move?
4. You can now lead the children to see that the clock, the spring, and the key were there when the clock was not running, but the clock did not run. There was no energy to make it move. Energy is needed to make an object move.

Extending the lesson:

1. Look for examples of larger machines that do not move until energy is used. (appliances, cars, trucks, and airplanes)
2. Develop a work chart of energy words - an "ENERCHART".
3. Have the children use each energy word - "ENERWORD" - in a sentence to indicate their understanding of the word.
4. Ask the class to suggest other things that can be moved without springs or electricity. (walking, throwing a ball)
5. Draw pictures of people moving things.
6. Make up a story of something you have done to make something move.
7. Make a bulletin board display of things being moved with energy.
8. Write a class experience chart of class discoveries.

Title: Getting Heat

Concept: Energy use produces heat.

Objective: To discover that heat is given off when energy is used

Introducing the lesson:

1. Rub your hands together.
2. Ask the children to rub their hands together.
3. Ask: What happens when you rub your hands together? (they get warmer)
4. Ask: What happens when the parts of a car engine rub against one another? (they get hot)

Developing the lesson:

1. Ask the children to show two different ways to keep warm. (jump, put on clothes or a blanket, drink a cup of hot chocolate, sit by a heater, etc.)
2. Ask them how they could keep warm without getting out of their seats. (move arms and legs, generally same ways as in #1)
3. Now ask them if they think one of the ways is enough. (can they jump all day and night?)

Extending the lesson:

1. Ask the children to draw a picture of a friend keeping warm:

   a. at school b. at home c. outdoors

2. Ask: What happens to the heat that is produced when energy is used? (lost in air)

   a. body (cools)
   b. car engine (cools)
   c. fire (goes out)
   d. electricty in heater, toaster, stove

3. Draw a picture of heat being lost or wasted.
4. Make a list of energy words learned in this lesson.

Title: Energy Can Be Stored

Concept: Energy comes in many forms.

Objective: To discover that energy is stored in many things

Introducing the lesson:

1. Bring in a big bag full of energy. (box of food, flashlight battery, thermos of hot tea or coffee, can of oil, candy, nuts, potato chips, etc.) Do not show the children what is in the bag! Leave in on your desk!
2. When the children ask what is in the bag, say: It is full of energy.
3. Ask: What do you think is in the bag?

Developing the lesson:

1. After the children have finished guessing what is in the bag, let them feel (but not look at) what is in the bag. Do not tell them what is in the bag.
2. Now ask them to collect ten (10) kinds of energy they can touch.
3. Do the same for energy they can hear, smell, or taste.
4. Show them what is in your bag!

Extending the lesson:

1. Ask: How are all the kinds of energy we have talked about the same? (all stored in food, wood, coal, oil, battery, etc.)
2. Ask: Can you think of some stored energy that would not fit in a bag? (oil or gasoline)
3. Ask the children to show a way of making their energy collection stimulate all the senses at once. (open the bags and boxes and have a little party!)
4. Add any new words to the class energy word list.

GRADE I, UNIT III, LESSON 1

Title: Fill A Box With Energy

Concept: Energy can be transferred from place to place.

Objective: To give children the opportunity to discover that energy can be captured for man's use

Introducing the lesson:

1. Bring in a big box (a box big enough to hold some children - refrigerator box, stove box, etc., from appliance store) and leave it at the front of the room. When asked what it is for, say: We are going to fill it with energy today.

2. Ask: What do you think we can put in it?

Developing the lesson:

1. Say: Let's fill the box with sunlight. Outdoors is best unless your classroom is facing the sun. Ask: What is happening? (box gets warmer)

2. Say: Now let's fill the box with heat. (use sun or warm objects)

3. Say: Now, let's fill the box with children. Ask: Is that a way to fill the box with energy? (box should get warmer - both inside and outside)

4. Ask: How could we keep the sunlight, heat or children in the box (store energy)? (Can't: heat and children will escape; sunlight will not enter the closed box. Have a child check this.)

Extending the lesson:

1. Ask the children to think of a box that could hold more than one kind of energy. (classroom, pantry, refrigerator, stove, food box) You might wish to discuss the danger of refrigerators to children.

2. Ask: How is a house like our box? (full of energy being stored and used)

3. Add new words to the class energy word list.

Title: Moved By The Wind

Concept: Energy can be changed from one form to another.

Objective: To discover the relationship between moving air and energy - that moving air has energy

Introducing the lesson:

1. On a windy day, take the class outside. Let a few sheets of paper blow from your hand (in a place where there are no cars).

2. Ask the children to catch the papers.

Developing the lesson:

1. Ask: What is needed to make something move? Remember our moving toy lesson. (energy)

2. Look for other things that are being blown by the wind. (flag, trees, hair, clothes)

3. Ask: How do people use the energy of the wind (moving air) to move things? (sailboat, fan)

4. Be your own wind. (blow out a candle, blow away a seed)

Extending the lesson:

1. Ask the children to:

   a. draw a picture of a sailboat on a calm day (no wind)
   b. move like the wind (children will be very creative - blown by the wind as a leaf, a bird, a paper, jumping into clouds; being blown away; snowing)

2. Catch the wind. (make a sail with your jacket)

3. Ask: Does moving air have energy? (Yes)

4. Tell a story about a seed being moved by the wind.

5. Add new energy words to the class energy list.

Title: Get Energy From the Sun

Concept: Most energy comes from the sun.

Objective: To discover the relationship between the sun's energy and the energy we use

Introducing the lesson:

1. Open the window drapes or shades and let the sun shine in.
2. Ask: What happens when we let the sun shine into the classroom? (heated, lighted)

Developing the lesson:

1. Ask: How can we show indoors that we can get heat from the sun? (feel the window sill, put a cold object on window sill and leave it for a few minutes, feel the sun on our backs)
2. Say: Let's go outside and see if we get heat from the sun outdoors. (If it is a cold day it may be harder to do. Sit with backs to sun. Feel children's clothes. Compare dark and light clothes.)
3. Ask: What other kind of energy do we get from the sun? (Light)
4. Compare places in the sun with places in the shade. Ask: Which is hotter? Which is lighter?

Extending the lesson:

1. Go outside and look for ways people use heat from the sun. (swimming, sunbathing, drying laundry)
2. Ask the children how their parents use the heat of the sun at home. (sunbathing, growing plants, heating swimming pool, porches and patios)
3. Look for ways people keep the heat of the sun out of buildings. (drapes, blinds, awnings)
4. Draw a picture of people using the sun's energy.
5. Add to the class energy word list.

Title: Use The Sun's Energy

Concept: We can use the sun's energy.

Objective: To discover that the energy of the sun is used by people

Introducing the lesson:

1. Turn off the lights and darken the room enough so that it is too dark to look at pictures.
2. Tell the class you are going to show them some pictures of people using the sun's energy.
3. Hold up several pictures of people growing plants, sitting in the sun, etc.
4. Ask: Why are we having so much trouble seeing the pictures? (not enough light)
5. Ask: How can we get more light? (turn on lights, open drapes)
6. Let the child who suggested opening the drapes open the drapes. Do not turn on the lights yet.

Developing the lesson:

1. Ask the children to pretend that there are no electric lights.
2. Ask: Is the light enough for us to see the pictures now? (show the pictures again)
3. If there is enough light, ask: Where does the light come from? (the sun)
4. If it is still too dark to see the pictures well, take the class outside the school and show them the pictures.
5. Ask: How have we used the sun's energy? (light energy to see)

Extending the lesson:

1. While the class is outdoors, review what they have learned in the previous lesson about heat energy from the sun.
2. Look for a place where the grass is covered with a board or paper. The grass will be yellow or dead. Ask: Why is the grass yellow or dead? (no sunlight, no energy from the sun)
3. Draw a picture of our school without the sun's energy.

Extending the lesson:

4. Draw a picture of a farm without sunlight.
5. Have the children tell a story of the sun's energy.
6. Add to the energy word list.

Title: Using Energy In Our School

Concept: Energy is used to provide for people's needs.

Objective: To give children the opportunity to discover how people use energy to provide the things they need - to give them heat and light - to move things

Introducing the lesson:

1. Turn out the lights. Ask: Do we need the lights turned on today? (yes)
2. Ask: Do we need energy to turn on the lights? (yes)
3. Ask: What else do we need energy for in school? (heat, to move things)

Developing the lesson:

1. Take a walk through the school to look for people using energy. Look for machines, heaters, air conditioners, lights, appliances in the kitchen.
2. Discuss each item on the list and why energy is used. (report needs of people - to see, to learn, to eat, to wash dishes, to move)
3. Ask: What would our school be like without energy? (darker, no TV or films, no cooking, no dishwasher, all cleaning done by hand, etc.)

Extending the lesson:

1. Have the children draw a picture of a classroom or school without electricity.
2. Have them describe their pictures. (Be sure to ask about other sources of energy.)
3. Show pictures of schools in places without electricity.
4. Add to the energy word list.

Title: People Using Energy

Concept: People use energy to change things.

Objective: To discover the relationship between the use of energy and people's needs

Introducing the lesson:

1. Take the class outside to a place on the school grounds where a street is in view and have the children watch for people using energy for their needs.
2. Keep a list of the energy uses the children see. (food, transportation, to move things, to change things, dig a hole, play, etc.)

Developing the lesson:

1. Ask: What is being moved in trucks? (The children may not be able to read the signs on the trucks, but you can help them identify an oil truck, food truck, moving truck, etc.)
2. Ask: Where do you think people in the cars are going? (to store, beach, work, etc.)
3. Ask: Do people need energy to move things?
4. Ask: Did anyone see energy being used to change things? (yes; holes being dug, earth moved, buildings built, roads repaired, etc.)
5. Ask: Do people need energy to change things?

Extending the lesson:

1. Draw a picture of energy being used to change something.
2. Draw the same picture with another kind of energy being used. (horse and wagon, shovel)
3. Show how energy is used in another way - by movement.
4. Make up a story about you moving something and making a big change.
5. Add to the class energy word list.

Title: How Much Is Enough?

Concept: Energy supplies are limited.

Objective: To discover that energy supplies may be limited because people use more than they need

Introducing the lesson:

1. Bring a box of cereal, a bag of dried beans, jelly beans or small pebbles. Say: In this bag (box) is all the food that is left on earth. Each piece will supply all the energy one person needs for a day.
2. Start passing out energy pellets, one at a time.
3. Ask: Did everyone get energy today?

Developing the lesson:

Keep passing out "daily rations" of energy until it is scarce; then until there is none left.

1. Ask: Did everyone get energy today? (no)
2. Ask: Why? (Our energy is all gone.)
3. Ask: What can we do? (Get more energy or try to live without it.)

Extending the lesson:

1. Ask: What does "scarce" mean? (There is not enough to go around.)
2. Draw a picture of yourself without enough food.
3. Describe your picture to the class.
4. Discuss with the children what the United States is doing to share its extra food with people who are hungry. Ask: How can we help to feed hungry people? (By not wasting food or eating more than we need.)
5. Add to the class energy word list. Review the list from time to time.

Title: Going Without Energy

Concept: Energy supplies are limited.

Objective: To discover the relationship between supply and demand for energy

Introducing the lesson:

1. Turn off the lights and say: Today we are going to pretend that we are living in a time when energy is scarce. There has been an accident at the power plant and we will be without electricity for a week.
2. Ask the children to draw a picture showing them in their home without electricity.

Developing the lesson:

1. Ask the children to describe their picture to the class.
2. Ask: What things do you miss most in your home without electricity? (TV, lights, stove, refrigerator, etc.)
3. Ask: Which things do you think you could get along without? (TV)
4. Ask: Which things could you not get along without? (refrigerator, etc.)

Extending the lesson:

1. Use the class list to discuss substitutes for their electric appliances. (candles, oil lamps, flashlights, games for entertainment)
2. Ask: Do these substitutes use energy? (yes, but not so much)
3. Ask: How could we keep food without a refrigerator? (We could not. We would have to shop for fresh food every day or use canned or preserved food.)
4. Tell the children about places in the world where there is no electricity - where people do not have to pretend there is a blackout - where energy supplies are limited.
5. Add to the class energy word list.

GRADE 1, UNIT VII, LESSON 1

Title: Wild Animals Need Energy

Concept: Living things are dependent on their environment.

Objective: To discover that animals depend on their environment to supply their energy needs - their food and shelter

Introducing the lesson:

1. Bring a pet or ask a child to bring in a pet hamster, turtle or rabbit to the classroom.
2. Ask: How is this pet animal like a child?

Developing the lesson:

1. Make a list of the needs of animals.
2. Ask: Are the needs of wild animals the same as the needs of pet animals? (yes)
3. Ask: Who supplies the needs of pet animals? (the pet owner)
4. Ask: Who supplies the needs of wild animals? (They are supplied by the environment of the animal - they catch their own food, build their own shelter, etc.)

Extending the lesson:

1. Ask: How can we help wild animals get all the energy they need? (We have to protect places where wild animals live, like forests, parks, lakes and swamps.)
2. Make a list of the wild animals that the children have seen and the food each one needs for energy.
3. Add to the class energy word list.

Title: I Can Help

Concept: Energy can be saved in many ways.

Objective: To discover that energy can be saved by people - that each individual can help to conserve energy

Introducing the lesson:

1. Read the following letter from the principal of the school:

Dear Children:

Each month our bill for electricity and fuel is getting higher, so we must save energy. If we do not, we will have less money for our playground equipment and field trips to neat places like the Nature Center.

So I am asking each of you to plan with your teacher how we can save energy in our school.

Thank you for your help, and good luck.

Sincerely,

___________, Principal

Developing the lesson:

1. Ask the children how they think the class could save energy. (Do not make any suggestions. Let them come up with their ideas first.)
2. When you have listed all the children's ideas, use this checklist to raise questions about things they may not have thought about.
    a. Are we using more lights than we need?
    b. Do we need to keep the room so warm or so cold? (Could we wear a sweater?)
    c. Do we leave lights on when we go to lunch or recess?
    d. Can we open windows on pleasant days instead of using air conditioning or heat?
3. List the ideas on the board as "Our Energy Conservation Program." (CON-SER-VAY-SHUN; conservation is just a big word for "saving".)

4. Invite the principal to come and see what you are planning to do to conserve (save) energy.
    a. Ask your principal to suggest other things.
    b. Ask if the other classes have an energy conservation program.
    c. Ask if there is a program to conserve energy in the cafeteria, kitchen, auditorium, hallways and the principal's office.

Extending the lesson:

1. Have the children design a sign they could put over the light switch to remind them about turning off unneeded lights.
2. Keep a record for a week of the number of minutes (hours) of light the class saved.
3. If this lesson is continued, ask the principal to compare the amount of energy used during the first month with the same month last year.
4. Have the children draw pictures of their class saving energy.
5. Do an energy conservation dance.
6. Ask the principal to host an energy conservation party to celebrate the energy savings.

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ENERGY TEST - GRADE 2

A Pre-test and Post-test Evaluation Instrument

1. What do babies need in order to grow? (food energy)

2. How is the energy in our food measured? (calories)

3. How can you send or receive energy over a long distance? (TV, radio, telephone, food from California, heat and light from sun)

4. Can we get energy we have used back again? (no)

5. List 3 ways you waste energy every day. (food, lights, heat)

6. Make an energy food chain from the sun to you. (sun, grass, cow, milk, me) or (sun, corn, chicken, egg, me)

7. How can you keep an ice cube from melting so fast? (cover it with materials - insulation)

8. List 3 ways to give some energy to someone who needs it. (food, fuel, candy, light, a battery)

9. How does energy from the sun dry wet clothes? (evaporation)

10. What do we call it when there is less energy than people need? (crisis, blackout, scarcity)

11. Give 5 words that describe energy. (dirty, clean, hot, oily, moving, bright, noisy)

12. List 3 things you do that need the family car. (scouts, movie, school, doctor, lessons, shopping, beach)

13. How do you get energy out of a fuel? (burn it)

14. How do you keep heat in a cooking pot? (put a lid on it)

Title: Energy Makes Things Grow

Concept: Living things use energy to grow.

Objective: To discover the relationship between food energy and growth

Introducing the lesson:

1. Show the children pictures of animals and their young, ranging in size from a whale or elephant (ask the children to name the largest and smallest animals) to a fly. Include a human mother and baby.

2. Ask the children to arrange the pictures around the room from the largest to the smallest (help them to distinguish between a large picture of a dog and a small picture of an elephant - or try not to use pictures which will confuse children regarding size).

Developing the lesson:

1. Ask: How will the baby animal get to be as big as its mother? (it will grow)

2. Ask: What will the babies need in order to grow? (food)

3. Ask: Is all the energy in our food used to help us grow? (no; some is used to keep us warm and some to make us move)

4. Say: Let's find out how much energy (calories) is in our food. For a week, have the children bring in empty cereal boxes, food boxes (jello, etc.) and candy wrappers. Have them compare the number of calories and the amounts of protein, carbohydrate and fat in the foods.

5. Have the children compare the calories in sugared cereals; for example, between corn flakes and "frosted" corn flakes.

Extending the lesson:

1. Ask the children if they think older people who have finished growing still need energy (food). (yes; they still need to move, keep warm, and grow new body cells which wear out - repair their bodies.)

2. Ask: Will a dog get as big as an elephant if it keeps eating? (No - dogs grow into dogs; only baby elephants grow into elephants. But some human babies may grow a little bigger than their parents if they eat lots of good food.)

3. Ask: Do you know any child who is bigger than its parents?

4. Draw a picture of an animal growing up and tell the story.

5. Start an energy word list - calorie, etc.

Title: Send Your Energy Over A Long Distance

Concept: Energy can be used to move things.

Objective: To discover that energy can be used to move things - even other energy

Introducing the lesson:

1. Stand quietly in front of the class. Scowl or put your hands on your hips when one of the children is noisy or "hyper". Then clap quietly when a child is quiet and sits still.
2. Ask: Did you get my message?

Developing the lesson:

1. Ask the children to send a message to you or to a friend without talking.
2. List the ways that children sent their messages without talking. (sign language, body language, knocking, rubbing their stomach, doing pantomime, etc.)
3. Ask: How do animals send messages? (sing, scratch, peck, knock, etc.)
4. Ask the children to try and understand their favorite Saturday TV cartoon without the sound and report back to the class on Monday.

Extending the lesson:

1. Have the children list the ways that they could send or receive energy over a long distance. (telephone, TV show from Hollywood, etc.)
2. Draw a picture of yourself sending a message to your teacher.
3. Ask: Can we get all of the energy we used back again? (No - most of the energy we use is gone forever, lost as heat or motion. New energy must be used.)
4. Add to the class energy word list.

Title: A Ray Of Light

Concept: Light is a form of energy.

Objective: To give children the opportunity to discover that light is a form of energy from the sun

Introducing the lesson:

1. If you do not have a window in the classroom into which the sun shines, take the class to the cafeteria, auditorium, library or any room with sun coming in the window.
2. Close the drapes or put a piece of cardboard or oaktag with a hole in it (the hole should be odd shaped) so the sunlight comes through and makes a lighted spot on the floor or on dark paper.
3. Ask the children to find a ray of light coming through the crack or hole and watch it change. (it moves, changes shape)

Developing the lesson:

1. Ask the children to feel the light.
2. Ask the children to describe the light.
3. Ask the children to draw a picture of themselves if they could crawl into the ray of light.
4. Ask the children to describe their picture.

Extending the lesson:

1. Take the class outside and demonstrate how a magnifying glass can focus (gather) the rays of light on a paper and burn a hole in it. (Caution: Children should not play with magnifying glasses - relate dangers)
2. Ask: Is there heat in the sun's rays?
3. Ask: What kinds of energy do we get from the sun? (heat and light)
4. Ask: Can the sunbeam be your new friend?
5. Add to the class word list.
6. Ask the children to use the new energy words in a sentence.

Title: Where Energy Comes From

Concept: Energy comes in many forms.

Objective: To give children the opportunity to discover the various forms of energy in their environment

Introducing the lesson:

1. Hand out drawing paper or butcher paper and a box of crayons; ask the children to draw a picture showing where energy comes from. (Do not give any help at all. Let the children go. Make no comment on their efforts until your planned time -- 10-15 minutes -- for this activity is up.)

Developing the lesson:

1. Ask each child to describe their picture.
2. List the sources of energy the pictures suggest.
3. Try to get the children to go all the way back to the real source - the sun - for all food and wood; millions of years ago for fossil fuels; uranium for atomic energy (omit uranium unless they mention it).
4. Make an energy chain of children from the sun (first child) to food or fuel (last child).

Extending the lesson:

1. Follow the same procedure to discover where energy goes. (eventually to waste heat)
2. Now draw pictures of energy being wasted.
3. Make a list of the examples of energy waste.
4. Get class suggestions on how to waste less energy.
5. Add to the class energy word list.

Title: Energy Goes From Place to Place

Concept: Energy can be moved from one place to another.

Objective: To give children the opportunity to discover the relationship between the place where energy is found and where it is used

Introducing the lesson:

1. Bring an ice cube to class and put it in a dish where the children can see it.
2. Ask: What is happening to the ice cube? (it is melting)
3. Ask: Why is the ice cube melting? (getting heat from the air and from the dish)

Developing the lesson:

1. Say: You have all seen an example of heat being passed from one object to another.
2. Say: Let us look for examples of energy being passed:
    a. from one living thing to another (food)
    b. from one place to another (heater)
    c. from one object to another (toaster to bread; iron to cloth)
    d. from an object to a person (hot seat)
    e. from a person to an object (cold seat)

Extending the lesson:

1. Take the class outdoors. Give each child an ice cube and tell them to keep it from melting (keep the heat from it) in any way they can. (let them wrap it, bury it, hold it, etc., do not help them)
2. Give an energy award - ENERWARD - to the child whose ice cube lasts longest.
3. Ask: How can we keep heat from the ice cube? (insulation)
4. Why were some methods more successful than others?
5. Ask how we could keep the energy from moving in the instances we discussed earlier in this lesson. (see section on lesson development)
6. Add to the class energy word list.

Materials needed:

1. 2 trays of ice cubes
2. newspapers, bags or any insulating materials

Title: Give Some Energy To Someone Who Needs It

Concept: Energy can be changed from one form to another.

Objective: To give children the opportunity to discover the relationship between the forms of energy and how people use them

Introducing the lesson:

This lesson is best done on a cool day.

1. Fill a bottle with hot water. (not too hot to hold)
2. Ask: Who has cold hands this morning?
3. Pass the hot water bottle to one of the children who raised their hands. Say: I have just moved some heat energy from the water bottle to ______________'s hands. I have just given energy to someone who needed it.

Developing the lesson:

1. Say: Let us see if we can think of other ways that energy could be given to someone who needs it.
2. Make a list of the children's suggestions. If they have trouble with this, suggest:

   food - to hungry person
   fuel - to cold person
   light - to person going out at night, etc.
3. Ask: Can energy be moved from one place to another? (yes)

Extending the lesson:

1. Ask the children to show you how energy can be moved and used in another place.
2. Ask them to get the energy back. (can't - once it is used, it is gone forever - or changed to another form)
3. Ask the children to use some energy to smile while the energy is being transferred.
4. Add to the class energy word list.

Title: The Sun Affects Our Lives

Concept: We get energy from the sun.

Objective: To give children the opportunity to discover the energy of the sun's radiation on the earth

Introducing the lesson:

1. Wet 2 paper towels in a dish of water or under a faucet.
2. Ask: How can I get these towels dry again?
3. When the alternatives - "put them in a clothes dryer" or "hang them in the sun," etc. have been given by the children, - say: Let us go out and see if the energy of the sun can dry the towels.

Developing the lesson:

1. Have the children decide where to place the towels. (be sure that one is placed in the shade)
2. You may wish to wet more towels so that more alternative methods may be tried.
3. Compare the hanging towels with towels on the ground.
4. Compare the towels in the sun with towels in the shade.
5. Compare windy and calm places.
6. Note: explain that wind is air that is moving because it has been heated by the sun, so the energy from the sun may dry the towels directly (with heat) or indirectly (by evaporation).

Extending the lesson:

1. Ask: Why do you think so many people dry their clothes in an electric dryer instead of hanging them in the sun to dry? (You will get some great answers - air too dirty, too much work, machine drys clothes at night or on rainy days, outside is too messy, live in an apartment, no room, etc.)
2. Do a class survey to see how many of the children's parents use the sun to dry clothes.
3. Do a survey of how grandparents dried their clothes.
4. Add to the class energy word list.

GRADE [illegible] UNIT IV, LESSON 2

Title: Energy From The Wind

Concept: Wind is a form of solar energy.

Objective: To give children the opportunity to discover the relationship between energy and the wind

Introducing the lesson:

1. Take the children outdoors, gather them in a circle around you and ask them to take twenty steps away from you and look for something being moved by the wind.
2. Ask them to come back to the circle around you as soon as they have found something being moved by the wind, but not to tell anyone what they have found.

Developing the lesson:

1. Ask the children one by one to come to the center of the circle and move like the something they found. Tell them not to tell anyone what they found.
2. Have the rest of the class try to guess what it was that each child found being moved by the wind.

Extending the lesson:

1. Ask: When the wind moves things, is it using energy? (yes)
2. Ask the children which movements they liked best. Let them all try to do that movement. They will have created a dance which shows how the energy of the wind moves things.
3. Using movement, compare the energy in a gentle breeze with energy in a gale.
4. Have the class draw pictures of themselves or friends moving like the wind.
5. Ask several children to describe their pictures.
6. Ask about personal experiences with wind (hurricanes, gales, dust storms).
7. Add wind words to the class energy word list.

Title: My Energy Use

Concept: People use energy in many ways.

Objective: To give children the opportunity to discover how they use energy in their daily lives

Introducing the lesson:

1. Ask: Have you used any energy today?
2. Make a list of the things the children mention.

Developing the lesson:

1. After the class list is "complete", look for things the children may have overlooked. Ask: How did you get to school? Did someone lift you out of bed and carry you to breakfast? Did someone carry you onto the bus, into the school, down the hall? Is the room warm, lighted, clean? In short, everything you do and everything you use requires energy.)
2. Go down the list and ask: How could we save energy for this use?

Extending the lesson:

1. Draw a picture of yourself using energy.
2. Draw the same picture showing energy being saved. (conserved).
3. Explain your energy conservation picture.
4. Add to your class energy word list.

Title: My Class Uses Energy

Concept: People use energy in many ways.

Objective: To give children the opportunity to discover the many uses of energy in their school

Introducing the lesson:

This lesson is really an extension of the previous lesson. However, it can be used alone - or first.

1. As the lesson starts, go and turn off the lights and say: Today we are going to discover whether or not our class can save some energy. (just as we investigated how each of us alone could save energy)
2. Ask: Can we get along without the room lights? If it is too dark, ask: What can we do to get enough light? (open the drapes)

Developing the lesson:

1. Make a list of the ways the class uses energy (field trips; heating room, cafeteria, library or auditorium; air conditioning). Do not list individual uses of energy.
2. Have the class make up a story about what the class could do to save energy (conservation).
3. Do it!

Extending the lesson:

1. Tell the principal and custodian about the class energy conservation plan.
2. Ask the custodian to take out one of every four of the fluorescent lamps. Ask the class to investigate whether they have enough light.
3. Adjust the thermostat for heat or air conditioning. (a degree or two)
4. Ask: How could we change the classroom temperature and still be comfortable?" (sweater for less heat; light clothes for air conditioning)
5. Extend the energy survey to the homes of the class.
6. Add to the class energy word list.

GRADE 2, UNIT VI, LESSON 1

Title: Energy Is Lost

Concept: When energy is used, some of it is lost and cannot be used again.

Objective: To discover the relationship between energy use and energy loss... usually as heat

Introducing the lesson:

1. Burn a few small pieces of paper in a foil pie plate filled with sand. As the flame burns down, ask: How can I keep the fire burning so we can get more heat or light? (add more paper - fuel)
2. Ask: Can we get more heat or light out of the burned paper? (No. Once the energy in the paper is used up, it is gone forever. It is lost to the air.)

Developing the lesson:

1. Ask: What other uses of energy cause heat to be given off?
2. Make a list of the class suggestions. (food energy; fuel energy; gasoline, oil, wood, coal)
3. Ask: Can we use any of these again? (No)
4. What happens to the energy that is used? (burned up to produce motion and heat)

Extending the lesson:

1. For each energy use, ask the children to suggest how the energy supply can be restored. (gasoline station, eating, etc.)
2. Draw a picture of a friend using energy.
3. Have the children explain how the use of energy in their picture uses up the energy supply. (changes to heat energy, which is lost)
4. Add to the class energy word list.

GRADE 2, UNIT VI, LESSON 2

Title: Not Enough Food

Concept: Energy supplies are limited.

Objective: To discuss the relationship between food energy supplies and the needs of people for energy (scarcity)

Introducing the lesson:

Take the class out on the playground or lawn to play the energy shortage game.

1. Use a string, stones or chalk (on asphalt) to outline a circle twenty feet in diameter. (the circle represents the whole earth)
2. Scatter a bag of navy beans unevenly (only a few in some places, many in other places) in the circle. (This is all the food on the earth).
3. Let half of the children go into the circle. (These are the people on the earth)
4. Count to ten. Each time you get to ten, each child can pick up a bean. This bean is the food (energy) they use to live.
5. Every time the children pick up beans, add one or two children to the circle. (New babies are born.)
6. When a child cannot find a bean before you count to four, they must leave the circle. (They died for lack of food.)
7. Continue until most of the children are out of the circle. (Food is scarce.)

Developing the lesson:

1. Ask: Why did it get harder and harder to find food? (more people, less food)
2. Ask: What do we call it when there is less energy than people need? (SCARCITY - energy is scarce)

Extending the lesson:

1. Discuss how people acted in the game:
    a. Did they cooperate? (at first)
    b. Did they compete? (yes)
    c. Were some people selfish? (yes)
2. Ask: Do you think our game is like real life?
3. Add to the class energy word list.

Materials:

1. Ball of string or chalk
2. 1 lb. bag of Navy beans

NOTE: If you have a large class, you should use a bigger circle and start with 3/4 of the class in the circle.

Title: Transportation in My Life

Concept: Energy is used to move people from place to place.

Objective: To give children the opportunity to discover the relationship between their needs for transportation and the energy supplied by their environment

Introducing the lesson:

1. Every day for a week, have each child keep track of all the things the family car is used for. If there are children in the class whose families do not have a car, have them keep track of any transportation used.
2. Make a list of all the different uses of transportation made by members of the class. (school, scouts, recreation, business, shopping, etc.)

Developing the lesson:

1. Draw a picture of yourself using transportation.
2. For each item on the class list of transportation uses, add the kind of energy used. (gasoline, body power, etc.)
3. Draw another picture of yourself using transportation if gasoline becomes very scarce and expensive.
4. Describe the two pictures you drew, explaining any difference between them.
5. Ask: How would the social life of your family change if travel was restricted?

Extending the lesson:

1. Ask the children to compare transportation by car and bicycle. Consider:
   a. safety
   b. energy used
   c. how far you can go
   d. anything else you want (air pollution, number of passengers, etc.)
2. Ask the children to make two lists of the things they do that require transportation.
   a. The first list should contain those things the must do.
   b. The second list should contain the things they could do without.
3. Add to the class energy word list.

Title: Energy Feelings

Concept: Energy use reflects the lifestyles of people.

Objective: To give children the opportunity to discover the relationship between the lifestyles and values of people and their use of energy

Introducing the lesson:

1. Put a large word ENERGY on the chalkboard or on a large sheet of butcher paper.
2. Ask the children to tell you words that describe energy. (pretty, ugly, hot, noisy, windy, fun)
3. Put the children's words in a list.

Developing the lesson:

1. Ask the children to draw a picture showing how energy is pretty.
2. Have the children tell a story about their picture.
3. Now have them draw an ugly cartoon about energy.
4. Have the children describe their cartoon.

Extending the lesson:

1. Ask the children to tell how they decided that energy was pretty or ugly.
2. Did all the class agree or did children have different ideas about what was pretty or ugly about energy? (Some people object to airplane noise; others drive to the airport to see and hear the jets take off.)
3. Read all the words on the class energy word list aloud together.

GRADE THREE

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ENERGY TEST - GRADE 3

A Pre-test and Post-test Evaluation Instrument

1. List 3 things you do that require energy. (work, play, study, TV)

2. Give an example of a change in your schoolyard and the energy used to cause it. (litter -- energy to make it, throw it away)

3. Give an example of 3 places plants store energy. (leaf -- lettuce; fruit -- orange; stem -- celery; root -- carrot)

4. Match the food and the animal that eats it for energy.

a. corn - (2)   d. bark - (3)   1. insect   4. termite
b. leaves - (1)   e. roots - (6)   2. chicken   5. deer
c. twigs - (5)   f. wood - (4)   3. beaver   6. nematode

5. Match the energy with the thing you do to get it.

a. heat - (3)   c. move - (4)   1. burn candle   3. rub hands
b. light - (1)   d. battery - (2)   2. start car   4. use muscle

6. List 3 energy changes you can predict. (growing, turning on light, starting car, getting cold, sunset)

7. List 3 ways you can enjoy the sun. (sunbath, heat, light, eat)

8. Match the sources and uses of direct solar energy in Florida.

a. air - (4)   c. soil - (2)   1. tourism   3. swimming
b. water - (3)   d. climate - (1)   2. crops   4. heat

9. Match the sources and uses of indirect solar energy in Florida.

a. air - (3)   c. soil - (4)   1. Gulf Stream   3. sailing
b. water - (1)   d. climate - (2)   2. recreation   4. feeding animals

10. List 5 things you do that wastes energy. (food, lights, heat, etc.)

11. Why is gasoline scarce? (supply running out, imported, costly)

12. Name three fossil fuels. (natural gas, oil, coal)

13. What kind of oil comes from the ground? (crude)

14. Which will we run out of first, solar energy or fossil fuel? (fossil fuel)

15. Match the jobs to be done with the energy used by Florida pioneers.

a. grinding corn - (4)   1. mule or oxen
b. plowing - (1)   2. horse
c. transportation - (2)   3. people power
d. drying food - (5)   4. water power
e. cutting wood - (3)   5. sun

GRADE 3, UNIT I, LESSON 1

Title: Energy Being Used

Concept: People use energy to work and play.

Objective: To discover the relationship between energy and work

Introducing the lesson:

1. Take the class outside and ask them to find different ways people are using energy and to make a list of the things the people were doing. (This may take a few minutes or as long as needed.)

Developing the lesson:

1. Back in the classroom, ask: How many saw people working? Make a list under work of all the "work" things children had on their list.
2. Now do the same for play, entertainment, anything else the children saw.
3. For each item on the work list, ask the children to suggest an energy-saving way of doing it.

Extending the lesson:

1. Discuss the possible good and bad effects of using each energy-saving suggestion.
2. Ask: How did you decide?
3. Start a class energy word list.

Title: Energy Can Change Things

Concept: Energy is the ability to do work.

Objective: To discover the relationship between energy and changes in the environment

Introducing the lesson:

1. Take the class outdoors to the playground, lawn or any area around the school building.
2. Tell the children that they have five minutes to find an example of something that is changing.
3. Ask them to return to where you are waiting as soon as they have found an example of change.

Developing the lesson:

1. On the chalkboard, make a list of the examples of change the children have found.
2. Group the examples in any way (natural, man-made, physical, chemical, growth, decay, life cycle, mechanical, etc.).
3. For each example, try to find what caused the change.
4. Ask: Was energy used? What kind?

Extending the lesson:

1. Ask the children to identify a change on their list that did not require energy. (can't)
2. Draw a picture of a change in the environment.
3. Explain your picture.
4. Add to the class energy word list.

Title: Food Has Energy

Concept: Energy can be stored.

Objective: To discover the relationship between energy and plant and animal (organic) matter

Introducing the lesson:

1. Ask the children to find a way to show that food has stored energy. Do not help them.

2. Have each child (or groups) design an investigation to show that food has energy. (be prepared to supply dishes of sand for burning things - nuts, any food can be burned)

Developing the lesson:

1. Have the children draw a picture proving that food has energy. (burning food)

2. Have the children describe their pictures.

3. Use old magazines to find pictures of animals eating plant parts (leaves, stems, bark, roots, seed, flowers, fruit, etc.).

4. Group the animals that eat certain plant parts.

5. Ask: Why do the animals eat only parts of some plants? (food stored there)

Extending the lesson:

1. Use food energy to heat something besides yourself.

2. Ask: What parts of plants do people eat? (parts with lots of stored food energy)

3. Look for news stories or pictures of food on fire. (grain elevators, etc.)

4. Use some "food for thought" (energy) to help someone who needs a mental lift.

5. Add to the class energy word list.

GRADE 3, UNIT II, LESSON 2

Title: An Energy Mobile

Concept: Animals depend on green plants for their energy (food).

Objective: To give children the opportunity to discover the relationship between animal food (energy) and green plants

Introducing the lesson:

This lesson is a follow-up of the preceding lesson; using pictures of animals eating plants to obtain the stored energy in them.

Developing the lesson:

1. Have the children construct mobiles with each arm representing animals that get their energy (food) from a plant part. For example, the seed eaters, the leaf eaters, etc.
2. Ask: Are there any animals that could be used on more than one arm of the mobile? (yes - omnivores like racoons and humans)

Extending the lesson:

1. Ask: Are there animals which do not fit on the mobiles? (yes - meat eaters)
2. Ask: Can you trace the source of the energy in the food of the meat eaters (carnivores)? (trace back to the plant which fed the animal eaten by the carnivore)
3. Ask: What was the original source of all food energy? (sun)
4. Add to the class energy word list.

Title: Getting Heat and Light

Concept: Energy comes in many forms.

Objective: To discover that energy can be changed from one form to another

Introducing the lesson:

1. Turn off the lights.
2. Light a candle and let it burn for a few minutes.
3. Ask: What kind of energy are we getting from the candle? (heat and light)
4. Ask: How did I get heat and light from the candle? (changed chemical energy in wax to heat and light by burning)

Developing the lesson:

1. Ask the children to find other ways of changing something to get heat. (rotting, bending a wire, rubbing)
2. Ask them to do the same for light. (match, electricity)
3. Ask them to do something to get heat. (rub hands, jump up and down)
4. Ask them to do something to get motion. (move)
5. Ask them to do something to grow. (eat)
6. Ask: In each case what have we done with stored energy? (changed it to another form)

Extending the lesson:

1. Do an energy change movement. (dance)
2. Add to the class energy word list.

Title: Predict An Energy Change

Concept: Environments are in constant change.

Objective: To discover the relationship between the work of people and changes in energy as it is being used

Introducing the lesson:

1. Take the class outdoors.
2. Ask them to find an example of an energy change they can predict. (Do not help them with suggestions.)

Developing the lesson:

1. Make a list of the energy changes which the children think they can predict.
2. For each item on the list, ask the children why they can predict an energy change. (car being started, child getting ready to run)
3. Ask: What people can you think of who make their living predicting energy changes? (weather forecaster, car mechanic, gardener building compost pile)
4. Add new ideas to the class list.

Extending the lesson:

1. Draw a picture of the changed energy being used.
2. Explain your picture.
3. Draw a picture showing energy forms and how they change.
4. Have the children explain how the energy forms changed in the drawings could be changed back again. (They can't; most of the energy used is gone forever.)
5. Add to the class energy word list.

GRADE 3, UNIT IV, LESSON 1

Title: I Can Enjoy The Sun's Energy

Concept: We get energy from the sun directly.

Objective: To give children the opportunity to discover the relationships between the sun's energy (radiation) and things they enjoy (heat and light)

Introducing the lesson:

1. Write in large letters on the chalkboard: I CAN ENJOY THE SUN'S ENERGY BY __________.
2. Read it aloud and ask the children to finish the sentence any way they wish.

Developing the lesson:

1. Ask the children to read their sentences.
2. Make a list of the ways children enjoy the sun's energy. (Did they mention heat, light, snow and rain, sunrise, sunset, moonlight, sunbathing, eating?)

Extending the lesson:

1. Ask if any children thought of a new way to enjoy the sun's energy after hearing the sentences of their classmates.
2. Ask the children to finish the sentences without using words.
3. Can they do a dance using two or more of the movements they developed to finish the sentences?
4. Add to the class energy word list.

Title: The Sun's Energy Affects My Environment

Concept: The sun's energy can be used indirectly.

Objective: To discover the relationship between the sun's energy and the environment - its air, soil and water

Introducing the lesson:

1. Review the preceding lesson on enjoying the energy of the sun.
2. Remind the children that all the ways of enjoying the sun's energy were direct - from the sun to them directly.
3. Ask the children to finish the sentence: "I CAN BENEFIT FROM THE SUN'S ENERGY INDIRECTLY THROUGH __________." (my environment; its soil, water, air, plants)

Developing the lesson:

1. Discuss how the sun's energy helps us indirectly through:
   - a. the air (climate, heat, seasons)
   - b. the soil (growing crops, feeding animals)
   - c. water (climate, swimming, home for wildlife)
2. Ask: How do people use this indirect solar energy?
   - a. climate...tourist industry in Florida, recreation
   - b. soil...growing vegetables, fruit
   - c. water...swimming, fishing

Extending the lesson:

1. Draw a mural showing how people use the sun's energy indirectly and directly. (It is hard to separate the direct and indirect uses; for example, when you consider tourism.)
2. Investigate the local winter crops that are sent to colder parts of the U.S. - an indirect benefit of solar energy.
3. Ask the children how they can tell a direct use of solar energy from an indirect use. (evaluation - indirect is through the environmental effects of solar energy; direct is from the sun to people)
4. Add to the class energy word list.

GRADE 3, UNIT V, LESSON 1

Title: My Energy "Wants"

Concept: People use energy to satisfy their needs.

Objective: To give children the opportunity to discover the relationship between their energy use and the things they want from their environment

Introducing the lesson:

1. Write a list of words on the chalkboard under the heading, "I WANT" (expensive car, banana split, motor-bike, sailboat, a stereo, etc.)
2. Ask: What are wants? (Things I'd like to have but may not need.)

Developing the lesson:

1. Ask each student to name one of their "wants"; list their "wants" on the chalkboard.
2. For each item on the list, discuss how it differs from a "need" - something they can't get along without.
3. Ask: How would the "needs" of a modern family be different from the families of their grandparents?

Extending the lesson:

1. Ask the children to describe some of their "wants" that have become "needs".
2. How did they decide? (values, lifestyles)
3. Add to the class energy word list.

Title: I Waste Energy

Concept: People use more energy than they need.

Objective: To give children the opportunity to discover that they are wasting some of the energy they use

Introducing the lesson:

1. Read a short newspaper article (or make up one) in which the President says, "We must all stop wasting our precious energy. Our nation's future depends on it." Say: Our principal, Mr./Ms. __________, has also asked us all to try to conserve energy here at school.
2. Ask: How can we save energy?

Developing the lesson:

1. Ask each student to list five things they do at home and at school that waste energy. (do not help them)
2. Make a class list on the chalkboard.
3. Discuss how effectively energy could be saved if the students stopped doing the things on the list. (Would they have to give up "needs" or "wants"?)

Extending the lesson:

1. Ask the students to stop doing the things they listed as "energy wasters" that are not needs.
2. Find five ways they can each save additional energy.
3. Ask: Is playing an example of wasting energy? (No. Playing develops muscles and coordination.)
4. Make a list of the ideas generated and share it with other classes, parents, etc.
5. Add to the class energy word list.

Title: A Movement I Enjoy

Concept: People use energy to satisfy their needs.

Objective: To give children the opportunity to discover the relationship between their use of energy and movement to express their feelings

Introducing the lesson:

1. Play a recording or tape of ballet music such as Tchaikovsky's "The Nutcracker".
2. Ask the children if the music makes them feel like doing an energy dance. (If it does, proceed with the lesson.)

Developing the lesson:

1. Ask the children to make a movement that seems to fit the music and suggests some kind of energy being used. (sun, wind, bird, water flowing - do not suggest; let the children create their own movement)
2. Ask if anyone has found a movement they enjoy that they would like to share with the rest of the class.
3. Let the others repeat the movement over and over until it becomes a dance.

Extending the lesson:

1. Have the children draw a picture of a friend doing the "energy dance".
2. Ask: Where did the energy for the "energy dance" come from? (the sun - food)
3. Add to the class energy word list.

Materials

Record or tape recording, and record or tape player

GRADE 3, UNIT VI, LESSON 1

Title: Show How Energy is Scarce

Concept: Energy supplies are limited by excessive demands on energy resources. SCARCITY.

Objective: To discover the relationship between supply and demand for energy

Introducing the lesson:

1. Put up a bulletin board display of pictures showing hungry children, thin animals, people carrying wood for cooking, cars at gas stations during the oil embargo.
2. Write the word SCARCITY on the chalkboard or over the bulletin board display.

Developing the lesson:

1. Ask the children to look at the pictures on the board to tell you what SCARCITY might mean.
2. If you do not get a "supply and demand" answer, ask: What was scarce in each picture? (food, wood, gasoline)
3. Ask: Why was each item scarce? (limited supply, too many people, greedy people, too much demand for the item)
4. Show examples of energy scarcity in the school, home and community.

Extending the lesson:

1. Ask: When is there a scarcity of an item? (When the demand for the item is greater than the supply.)
2. Have the children suggest some things people might do to avoid scarcity of each item - food, wood, gasoline, etc.
3. Have each child identify one thing they do that saves energy.
4. Ask: Would you be willing to share with children who are hungry?
5. Add to the class energy word list.

GRADE 3, UNIT VI, LESSON 2

Title: Collect "Energy Crisis" Cartoons

Concept: Energy supplies are limited.

Objective: To give children the opportunity to discover the relationship between people's values and their awareness of the energy "crisis"

Introducing the lesson:

1. Bring in one or two cartoons that relate to the "energy crisis" or to energy.
2. Discuss what a cartoon is and ask if the children can "get the message" the cartoonist wanted to convey.
3. Ask the children to bring from home cartoons from newspapers, magazines and industry reports - any cartoons - relating to energy. (Be sure to have cartoons from both industry and environmental groups and cartoons showing differing values or biases.)

Developing the lesson:

1. At the end of the week, group the cartoons according to energy forms, supply, use, politics, etc.
2. Ask the children to determine the message and the values promoted in each cartoon.

Extending the lesson:

1. Ask the children to evaluate the effect of a cartoon compared to a news story.
2. Ask: Why is a cartoon so good? (usually funny, easy to read, has an easily understood message, etc.)
3. Ask the children to draw a cartoon relating to any energy question in which they have an interest. (the cost of candy?)
4. Add to the class energy word list.

GRADE 3, UNIT VII, LESSON 1

Title: Electricity In My Life

Concept: People are dependent on the environment for their energy.

Objective: To give children the opportunity to discover the relationship between electricity use and their environment

Introducing the lesson:

1. Display pictures or show a film that deals with life in pioneer days.
2. Ask the children to make a list of the uses of energy they see in the pictures or film.

Developing the lesson:

1. Ask: How did the pioneers heat their homes? (wood stove or fireplace)
2. Ask: What did they use for light? (oil lamp, candles, fireplace... President Lincoln studying)
3. Ask: What energy did they use to do their work? (body energy, horse, mule, oxen, water wheel, windmill, etc.)

Extending the lesson:

1. Have the children compare their own use of electricity with the pioneers' energy use.
2. Compare electric use in their homes today with the homes of their parents and grandparents.
3. Do the same for recreation. (TV, movies, radio, etc.)
4. Ask: How has people's use of electricity affected the environment? (air and water pollution, strip-mined land, etc.)
5. Add to the class energy word list.

GRADE 3, UNIT VII, LESSON 2

Title: Moving Water

Concept: Water in motion has energy.

Objective: To discover the relationship between water in motion and the energy it exerts

Introducing the lesson:

1. Show pictures of a surfer, a water wheel, a boat or raft going through the rapids, and any other pictures you can find that show water moving an object.
2. Ask: What do all these pictures have in common? (all show water moving something - that is, exerting energy)

Developing the lesson:

1. Ask the children to suggest some ways that water moves things. (hose, gutters, river)
2. Have the children draw pictures showing that water in motion has energy to do work.
3. Have them explain their picture to the class.

Extending the lesson:

1. Use the energy of moving water to do something.
2. Ask: Why did people stop using water power? (it was cheaper and easier to use electricity)
3. Ask: Could we use water power again? (yes, in some places for some things.)
4. Add to the class energy word list.

ENERGY AND MY ENVIRONMENT

SUPPLEMENTAL ACTIVITIES
FOR
KINDERGARTEN, GRADE ONE, GRADE TWO, GRADE THREE

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KINGERGARTEN, UNIT I, LESSON 1

Title: Listen For Energy Being Used

Purpose: To discover the relationship between work and energy being used

Materials: Tape player, tape of sounds recorded at home

Procedure:

1. Record many household sounds on tape. (vacuum cleaner, sewing machine, toaster, mixer, dishwasher, lawn mover, etc.)
2. Play the tape and listen to the sounds.
3. Have students identify the sounds as they listen to the tape.

KINDERGARTEN, UNIT I, LESSON 2

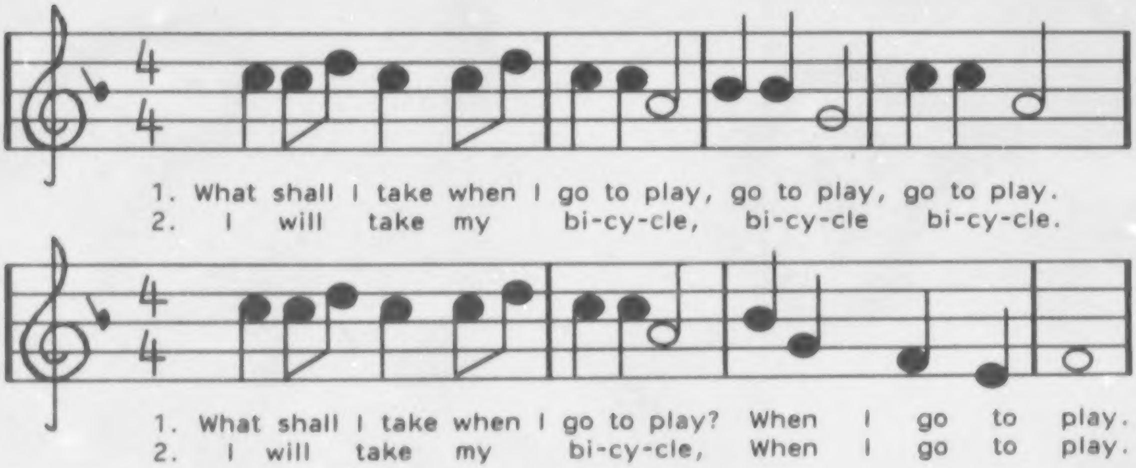
Title: A Friend Uses Energy

Purpose: To discover that people use energy as they move and as they do their work

Material: Tape player, or record player or piano

Procedure: Discuss the work mother and dad do during the day. Have the students act out the work they are discussing. Sing and play "Here We Go 'Round the Mulberry Bush." Discuss the energy children use as they play during the day. Sing and play "What Shall I Take When I Go to Play?" to the tune of "Here We Go 'Round the Mulberry Bush."

WHAT SHALL I TAKE?


1. What shall I take when I go to play, go to play, go to play.
2. I will take my bi-cy-cle, bi-cy-cle bi-cy-cle.
1. What shall I take when I go to play? When I go to play.
2. I will take my bi-cy-cle, When I go to play.

3. Bouncing ball 4. Jumping rope 5. Bat and ball

Title: A Friend Uses Energy

Purpose: To understand the energy sources commonly used to do work

Concept: Energy is so basic that nothing moves or is accomplished without it.

Procedure:

1. Review with children the idea that work in the scientific sense is generally related to motion. Objects at rest tend to remain at rest unless force (energy) is applied to move them. Energy is often defined as the ability to do work.

2. Engage children in the class in lifting or pushing several of the objects in the classroom such as books, erasers, chalk, chairs, objects on the window ledges, and so forth. Help children understand that in all of these lifting and pushing activities, work was being done and the energy was provided by their muscles and thus from the food they eat.

3. As a homework assignment ask each child to bring in 24 pictures from magazines or other sources that show work being done by machines or people in daily life going on around them. Analyze the pictures as a class and group them according to the energy source that is responsible for the motion (or work) being done. Organize the pictures into a wall or bulletin board display. What sources of energy seem to be most prominent in our society?

Title: A Friend Uses Energy

Purpose: To identify energy usage patterns of students

Materials: Toys that move or can be moved

Procedure:

1. Play "Simon Says" with the class doing simple motions. After a few minutes, discuss what actions they just finished. Have them draw these actions using simple stick people. Tell the class that every time they performed these actions they were using energy.

2. Demonstrate toys in action. Ask students what made these toys move. (sample answers: electricity, batteries, muscle power, etc.)

3. Lead students to observe that people, electricity, or anything else that makes things move, use energy.

4. Help students devise an inventory sheet to determine "How do you use energy?" To do this, students can make an energy picture book composed of drawings, newspaper and magazine clippings, or photographs showing the ways in which they individually use energy.

KINDERGARTEN, UNIT II, LESSON 1

Title: Ways To Keep Warm

Purpose: To find different ways people can keep warm

Materials: 1 large posterboard, old winter catalogs, scissors, paste

Procedure: Look through the catalogs to find things that can keep you warm, cut them out and paste on the poster. Include clothes, blankets, heating appliances for home and car. Discuss how energy is produced.

KINDERGARTEN, UNIT II, LESSON 2

Title: Energy You Can Touch

Purpose: To recognize that some forms of energy can be stored

Materials: Battery operated toy or flashlight, good battery, dead battery

Procedure: Use the batteries to operate a toy car or flashlight. Discuss. Compare good batteries and dead batteries.

KINDERGARTEN, UNIT III, LESSON 1

Title: Move Some Energy

Purpose: To show that the school bus driver and bus are using energy to bring children to school every day

Materials: Large mural paper, paint, brushes

Procedure:

1. Discuss children getting up in the morning, eating breakfast to get energy in preparation for working during the day.
2. Discuss energy the school bus uses to take them to school. Discuss the driver's work. (The driver uses "person energy" to drive the bus.)
3. Paint a big picture of a school bus picking up students to take them to school.

KINDERGARTEN, UNIT III, LESSON 2

Title: Warm Something

Purpose: To discover heat can be passed from one thing to another

Materials: Hot plate, pan, spoon, chocolate pudding mix (not instant), milk

Procedure:

1. Follow directions for making pudding. Discuss, as you put the ingredients together, what is happening to the powder.
2. Ask these questions:

   What does it look like? (chocolate milk)
   Where does the heat come from to cook the pudding? (hot plate)
   What is the heat doing? (changing chocolate milk into pudding)
   What does the pudding look like now? (thick)
   Can we eat it now? (No, it's too hot)

3. After it has cooled ask: Where did the heat go? (It went into the air.)
4. Eat the pudding.

KINDERGARTEN, UNIT IV, LESSON 1

Title: Enjoy The Sun's Energy

Purpose: To discover that the sun gives us energy

Materials: Chart paper

Procedure:

1. Take class outside and sit in the sun. After sitting in the sun for a while ask:
    - a. How does the sun make you feel?
    - b. Where is the heat coming from?
    - c. Does the heat you feel come from the sun's energy?
    - d. Why do some people need to use sunglasses when they are in the sun?
2. Write a story about the sun's energy. (Write children's suggestions on chart paper or chalkboard.)

    (Sample Story) Our Sun's Energy

    The sun is very hot. The sun gives us heat. The sun gives us light. We get energy from the sun.

3. The story may be read again the next day.

KINDERGARTEN, UNIT IV, LESSON 2

Title: "Feel" The Light Of The Sun

Purpose: To give the children the opportunity to discover we get light from the sun

Materials: Prism, white paper

Procedure:

1. Use a prism to create a "rainbow" on a white sheet of paper. Discuss what happens.
2. Close all blinds, but leave a small area where light can enter. Discuss what is happening in the small area where light is coming in. What happens when children pass their hands through the rays of light entering the room?

KINDERGARTEN, UNIT V, LESSON 1

Title: My Energy Needs

Purpose: To discover how we use energy to supply our needs

Materials: Magazines, scissors, paste, chart paper

Procedure:

1. Cut out pictures to make charts of how energy supplies our needs. (gasoline, electric, etc.)
2. Cut out pictures that show how energy supplies our wants. (T.V., computer games, etc.)
3. Make a "needs" chart and a "wants" chart using the cut out pictures.

KINDERGARTEN, UNIT V, LESSON 1

Title: My Energy Needs

Purpose: To examine how dependent we are on petroleum and electricity

Concept: Energy, its production, use, and conservation are essential in the maintenance of our society as we know it.

Activity:

1. Ask the children to bring pictures from magazines and/or to draw pictures of things such as houses, automobiles, boats, refrigerators, TV sets.
2. Assemble the pictures and/or drawings in a large collage. Discuss the extent to which the "good life" as they envision it depends on petroleum products, on electricity, on owning many material things that require energy to produce and operate.
3. Ask:
    - a. Should "old folks" be saving gasoline and electricity now so that plenty will be available for use many years from now? Why or why not?
    - b. What can you do now to save energy for the future?
    - c. Do you believe you are trying to save energy?
    - d. What are you doing to save energy?

KINDERGARTEN, UNIT V, LESSON 2

Title: Do Something You Like -- Change Something

Purpose: To discover that people use energy to do things and that people long ago used different forms of energy

Materials: Drawing paper, crayons

Procedure:

1. Discuss the kinds of energy used in the students' homes for cooking, going from place to place and lighting.
2. Ask if they know what kind of energy people long ago used for cooking, etc.
3. Discuss how the lifestyles have changed. Draw pictures to show uses of energy now and long ago.
4. Have children pantomime how they think people got and used energy in times long ago and how we get and use energy today. (to cook, travel, communicate, heat, make light, do laundry, etc.)
5. Discuss students' personal feelings about the differences in early and modern methods of energy production and use.

KINDERGARTEN, UNIT VI, LESSON 1

Title: Let's Share Some Energy

Purpose: To discover that energy supplies are limited and must be shared (Scarcity)

Materials: Hot dogs, solar cooker (made of cardboard box lined with aluminum foil and unpainted coat hanger: directions below and on next page)

Procedure: Make solar hot dogs for half of the class. The children must share the food for all to create energy. (in their bodies) Discuss other kinds of energy that might be scarce.

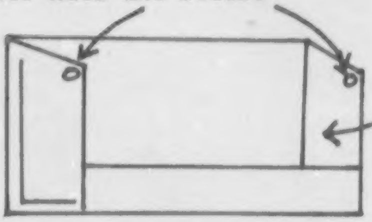
MATERIALS:

1 HOT DOG
CARDBOARD BOXES
ALUMINUM FOIL
COAT HANGER, THUMBTACK,
STRING, PENCIL
2 SMALL NUTS AND BOLTS
RUBBER CEMENT

DO THIS FIRST:

Cut the top and front out of a cardboard box to make a frame for your solar cooker!

Poke holes here for nuts and bolts!



THEN, DO THIS:

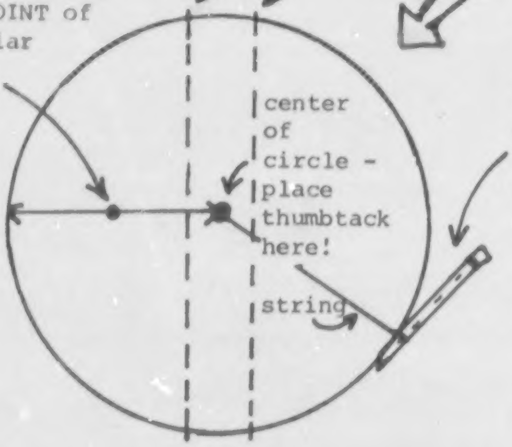
Measure the radius of the circle, and make a mark halfway.

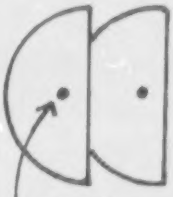
This is the FOCAL POINT of your solar cooker.

cut on dotted lines

Make 2 large cardboard circles like this:

Use the string to hold the pencil, and attach the other end to the thumbtack. Hold the pencil tightly, straight up and down, and draw a circle on a piece of cardboard! Then, cut apart as shown.





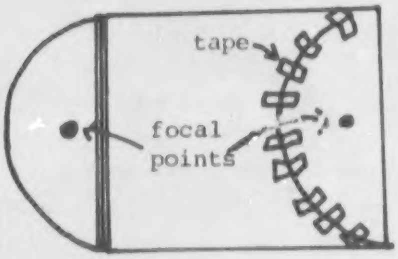
Now, glue 2 pieces together to make 1 that's twice as heavy!

Do this with both circles you cut.

match focal points

NOW, PUT THE 2 CURVED PIECES TOGETHER LIKE THIS:

Cover all of inside with aluminum foil!

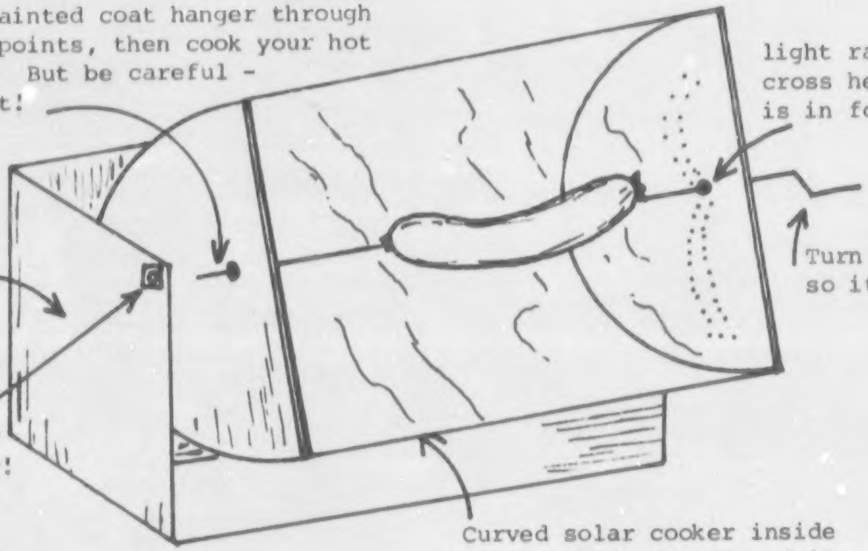


Tape another piece of cardboard to the curved edges of the 2 half circles you glued together -

the width of the piece of cardboard should be slightly less than the width of the box you cut to make a frame!

Then, cover the inside of this piece with aluminum foil - use rubber cement!

ADJUST THE COOKER SO THAT YOU CAN SEE THE SUN'S RAYS CROSS ON THE FOCAL POINTS. HOW LONG DOES IT TAKE TO COOK A HOT DOG?



Put an unpainted coat hanger through the focal points, then cook your hot dog on it. But be careful - it gets hot!

light rays should cross here when cooker is in focus

cardboard box frame

Turn your hot dog so it cooks evenly!

nuts and bolts to hold the frame and solar cooker together!

Curved solar cooker inside covered with aluminum foil

Title: Getting Tired

Purpose: To have the children discover that the energy in their bodies is limited

Materials: "Hap Palmer" record, marching record, record player

Procedure:

1. After a physical education class or after exercising to a "Hap Palmer" record, have children discuss how their bodies feel. (tired)
2. Talk about ways to renew energy in their bodies besides eating and getting a drink. (Emphasize the need for rest and the importance of nap time or sleep)
3. After a few minutes of rest, exercise to marching music. Have students pretend they are in a marching band.

KINDERGARTEN, UNIT VII, LESSON 1

Title: My Environment Supplies Energy

Purpose: To give the children the opportunity to discover that we depend on our environment for our energy

Materials: Seeds, soil, flower pots, magazines, scissors, paste.

Procedure:

1. Plant seeds in a garden outside and plant some of the same kinds of seeds in pots. Keep pots in classroom.
2. Discuss the importance of sun, heat, water to grow plants.
3. Find pictures of different foods we eat. (Basic 4) Make a booklet using pictures.
4. Discuss how each kind of food depends on the sun for energy. Discuss where the energy comes from to grow the plants we use for food.
5. Watch plants grow and discuss their development.

KINDERGARTEN, UNIT VII, LESSON 2

Title: I Depend on Others For My Energy

Purpose: To give the children the opportunity to discover that we depend on many people to supply our energy needs

Materials: Crayons, drawing paper, pencils

Procedure:

1. Have students tell what they had for dinner the night before and discuss how our dinner gets to us. (Start with vegetables and meat from the farm)
2. Take a field trip to a grocery store, trucking company, food plant, fruit packing house.
3. Draw pictures of the people who are responsible for getting one kind of food to your plate.

GRADE 1, UNIT I, LESSON 1

Title: Body Language

Purpose: To discover energy is being used to give a message

Procedure:

1. Divide class into groups. Each group chooses a type of work that their fathers or mothers do.
2. Using no words, one group pantomimes these kinds of work. The other group must guess what work they are doing.
3. Continue this activity until all groups have participated.

GRADE 1, UNIT I, LESSON 2

Title: Move An Object

Purpose: To see that energy is used to make something move

Procedure:

1. Discuss some things mother does when she cleans the house. (washing dishes, cleaning windows, moving furniture, using the vacuum cleaner, etc.).
2. Ask:

   a. When does mother begin to work? (Usually in the morning when she has had breakfast and has lots of energy)
   b. How is she able to put the dishes in the cupboard? (She needs to lift the dishes and walk to put them away)
   c. What happens if she needs to sweep under the sofa or chair? (She needs to move the furniture and use the vacuum cleaner)
   d. How does this vacuum cleaner sweep the floor? (It needs electricity, it needs someone to push it)

3. Energy is used to move things from one place to another.

   Ask:

   a. How does mother feel when she has finished cleaning the house? (tired)
   b. How can you help your mother clean the house?

GRADE 1, UNIT I, LESSON 2

Title: Move an Object

Purpose: To stimulate students' awareness of personal energy

Objective: Students will gain awareness of themselves as sources of energy

Procedure:

A. 1. Select a heavy object in the room or school grounds. Ask the students to help you move the object.

   2. Ask students to move some desks or tables in the room.

   3. Play a game, such as jumping rope or throwing a ball, that involves the students using their physical energy.

B. Discuss with students what they did, asking how they were able to perform the task in A. Use responses such as "I am strong" to get them to talk about their own physical strength. You may want to use the following questions to guide the discussion:

   1. What did you just do? (i.e., moved a table)

   2. What helped you to do it? (i.e., my strength, my arms, my energy)

C. Write the word "energy" on the board, or on a big sheet of paper. Discuss with students how they used their energy in Activity A. Energy is "what we use to help us do things." We use energy to help us do things every day. Students should see how they have just used energy to move something or play a game. Have students draw an example of energy they use, or have them act out using energy in class or on the playground. Students might act out playing a game or riding their bikes, walking or running. Be sure that students understand that energy involves motion. It is not energy unless it is used to do something.

D. Draw the following pictures to show people using energy. Ask students to describe the actions that the boys and girls are doing in each picture. Ask them what energy the actions require.

   Draw a picture to show:

   1. A girl brushing her teeth. (This takes arm energy).

   2. Girls and boys raising hands in class. (This takes arm energy, too.)

   3. A girl riding a tricycle. (This takes leg and arm energy.)

4. Girls and boys jumping rope. (It takes leg energy to jump, and arm energy to move the rope.)

5. A boy finishing a race. (This takes leg energy, but also breathing and heart energy).

E. You can have students color the pictures. As they are coloring, you may want to discuss their pictures with them individually, and show how the boys or girls are like or unlike them in using energy.

F. Discuss the fact that people have energy, and we use our energy every day. Help students to see how energy is important to us every day by discussing the following questions and listing students' responses to Question 1 on the board or paper under the word "energy."

1. What did you do yesterday or today that used your energy? (i.e., ran, walked, played ball)

2. What things on the list would you not be able to do if you had no energy? (i.e., almost everything)

3. Why is energy important to you? (i.e., because everything we do requires it)

G. Suggest to the students that they can call their energy their "person power." Ask them to make a list (in their heads or on a piece of paper) of the energy (person power) they use from the time school ends that day until they leave for school the next morning. Tell them members of their family can help them.

H. When students return to class, have them describe their uses of their person power. Write their items on a big sheet of paper that can be saved with the word "energy" at the top.

GRADE 1, UNIT II, LESSON 1

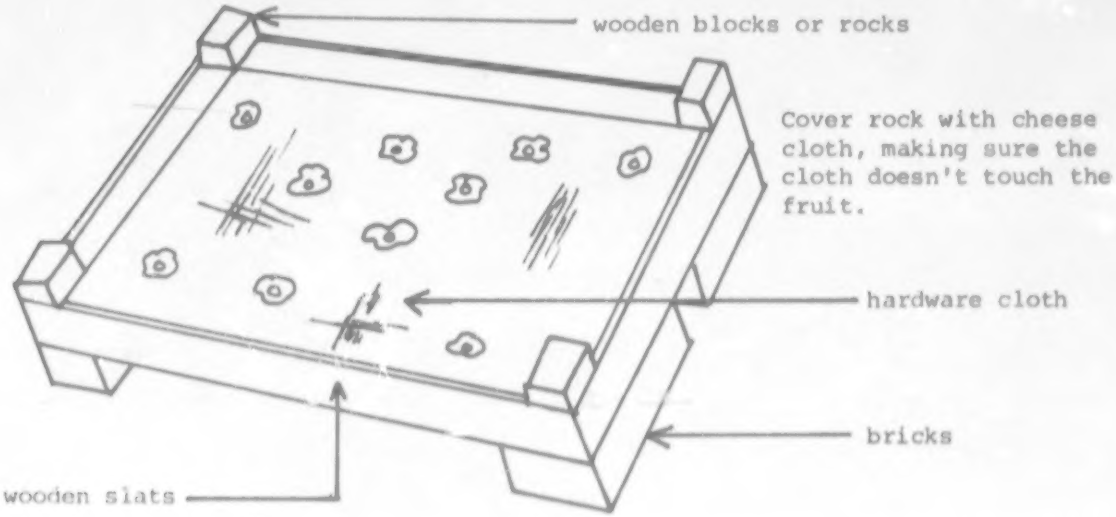
Title: Getting Heat

Purpose: To discover heat is given off when the sun's energy is used

Materials: Magnifying glass, paper

Procedure: Let the sun shine through on to a magnifying glass. Feel the heat under the glass. Put a piece of paper (with the corner folded up) under the magnifying glass. What happens? (The paper starts to burn.) The sun's energy has produced enough heat to start the paper on fire. We should be very careful not to leave old papers and clothes in front of a window where the sun comes through. It might start a fire. (Caution: Children should not play with magnifying glasses - relate dangers)

Option: Build and try the Solar Fruit Drying Rack.


wooden blocks or rocks
Cover rock with cheese cloth, making sure the cloth doesn't touch the fruit.
hardware cloth
bricks
wooden slats

GRADE 1, UNIT II, LESSON 2

Title: Energy Can Be Stored

Purpose: To classify different forms of stored energy

Procedure: Discuss different forms of energy - sun energy, food energy, electrical energy, energy from oil, gasoline, etc.

Have students draw pictures of a stored energy. Discuss the pictures and arrange on the bulletin board under headings for each energy form.

Optional Lesson: Build and use the Solar Fruit Drying Rack

Title: Fill a Box With Energy

Purpose: To give the children the opportunity to discover that we get energy from balanced meals

Materials: Boxes, paints, construction paper

Procedure: Collect boxes with lids in all shapes and sizes. Paint your box in a solid color or cover it with colored paper to cover any printed matter. Select one food from any of the Basic 4 and draw, paint or color it onto all the sides of your container. When everyone has finished, take turns stacking the boxes to make different "balanced" meals.

GRADE 1, UNIT III, LESSON 2

Title: Moved By the Wind

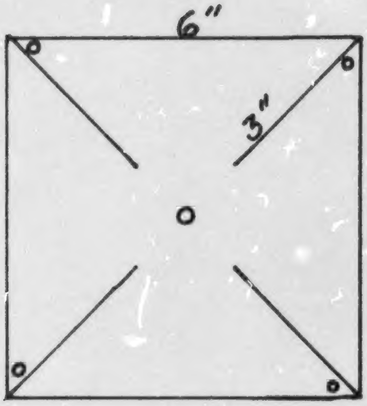
Purpose: To discover that moving air (wind) has energy

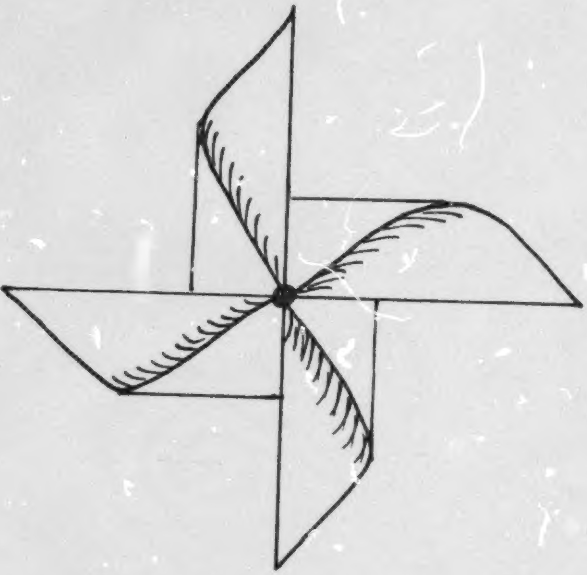
Materials: 6" square paper, scissors, straws, pins

Activity: Make a pinwheel

Procedure:

1. Pass out the paper squares and help children make the pinwheels. Using scissors, cut in from the corner (about 3 inches) of a 6" square. Put a pin through each dot on the corners and stick pin into a paper or plastic straw.





2. Will pinwheels work without blowing on them? Blow gently to make pinwheel turn. Blow harder. What happens?

3. Take pinwheels outside to let the wind move them. What happens? (The harder the wind blows, the faster they go.) Wind has energy to move things.

Optional: Place drops of poster paint on finger paint paper that has been moistened. Blow through a straw to move paint and create a design. Ask students what causes the paint to move?

Make kites to fly on a windy day.

Title: Get Energy From the Sun

Purpose: To identify the sun as a source of energy

Materials: Box of cereal, 2 samples of the same kind of plant (one grown in normal light and one grown in almost total darkness - perhaps a potato plant)

Procedure:

1. Hold up a box of cereal before the class. Say: I saw on TV a commercial for breakfast cereal. The announcer said that this breakfast cereal could give me energy. How could a breakfast cereal give me energy?

2. Ask the children who have pets at home to stand. Ask: Do animals also get energy from food? (Call on each child who is standing.) Ask: What kind of pet do you have? What do you feed your pet? How does your pet use the energy in the food?

3. Say: If we get energy from food, and animals get energy from food, how do you suppose plants get energy? Are plants living things?

4. Say: The sun gives light energy which is used by plants. Then place the two plants in front of the class; the plant which has been growing in the light and the one that has been growing in the dark. Explain where each had been growing. Have the class observe differences. (The one grown in the dark is likely to be taller and a lighter shade, whereas the one in the light will be a healthy green color, bushier rather than tall and straggly.)

5. Compare the conditions for growth of the one in the dark with the one in the light. Bring out the fact that sunlight made the difference. Sunlight is necessary for the growth of most plants. We get light from the sun.

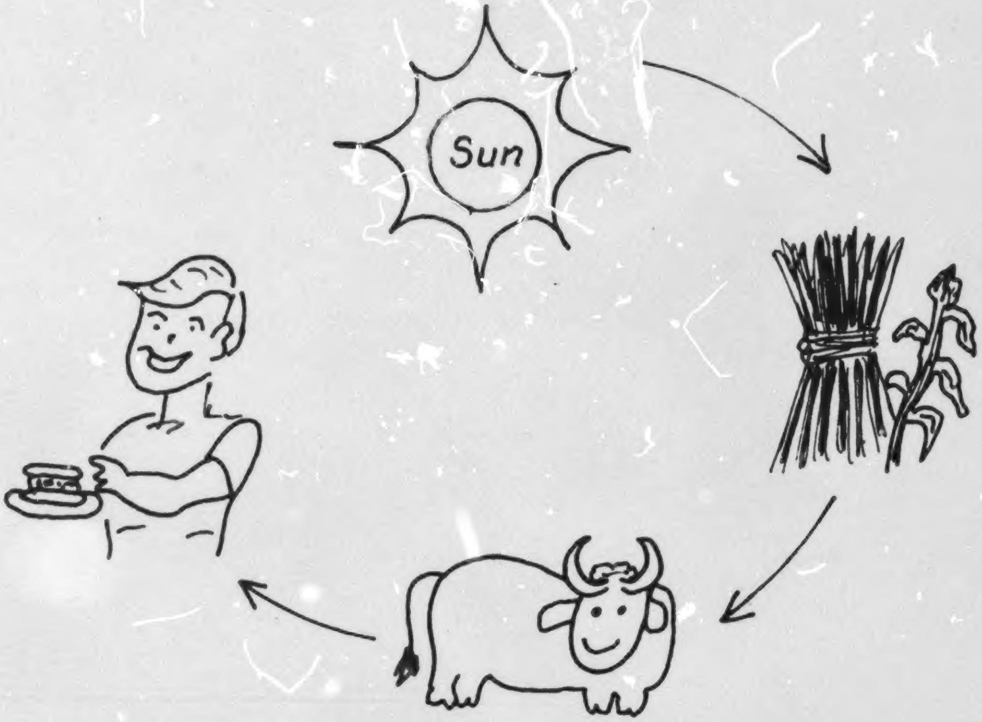
GRADE 1, UNIT IV, LESSON 2

Title: Use the Sun's Energy

Purpose: To understand that the sun's energy provides energy to our muscles through the food chain

Procedure:

1. Discuss the food chain.
2. Ask: How do animals get food? (move around, eat plants or other animals)
   How do plants get food? (They get energy from the sun).
3. Draw a picture on the chalkboard that shows how the energy from the sun gets energy to our muscles. Have children come to the board and help.



GRADE 1, UNIT IV, LESSON 2

Title: Use the Sun's Energy

Purpose: To demonstrate the heating effect of sunlight

Materials: 2 identical containers and 2 thermometers

Activity: Using a thermometer

Procedure:

1. Since most of the students cannot read a thermometer, you might wish to use uncalibrated ones. Using a grease pencil, mark the initial and final readings. Interpretation can be based upon a change or rise in the column.

2. Have students fill the two containers with water. Put one container in sunlight and the other in the shade. Initial temperature readings should be taken. (The teacher may want to make an actual degree reading.)

3. After one hour, students should check their containers and make a final temperature reading. Discuss with the students what has happened.

4. Ask: Has there been a change in the water temperature?
   How can you tell?
   Has the temperature increased, decreased, or stayed the same?
   Did the sunlight have any effect on the water temperature?
   Did the shade have any effect on the water temperature?

Optional: Students can paint their containers with non-water-soluble flat black paint and repeat the exercise. Did the black paint have any effect on the water temperature?

Discuss the use of solar energy to heat homes.

Title: Use the Sun's Energy

Purpose: To increase students' energy awareness and to add to their vocabulary of energy-related terms and words

Materials: A card for each student divided into 16 squares, markers cut from construction paper

Activity: An energy game (similar to bingo)

Procedure:

1. Make a list of energy-related terms or words on the chalk board. (at least 20, with students' help) Give each student a card and markers.
2. Have students draw a picture in each of the sixteen squares representing a different energy-related term or word using those listed on the board.
3. Teacher can act as "caller" and will give clues to describe one of the terms or words.
4. Children will cover the picture, representing that term or word, with a marker.
5. The first student to get four squares in a row calls "Energy."
6. The teacher checks the student's answers. If the student is wrong, the game continues and the student is eliminated from the game.
7. As a follow-up activity, students can work in small groups to devise their own game (terms and clues) and then administer it.

GRADE 1, UNIT V, LESSON 1

Title: Using Energy In Our School

Purpose: To observe and learn how electricity is used in our school

Materials: Drawing paper with lines at the bottom, crayons, pencils

Procedure:

1. Make arrangements prior to this lesson to visit custodians room, lunchroom, library, office.
2 Take the students on an energy tour. Come back to the classroom and discuss how electricity is being used in your school.
3. Assign groups of children to draw pictures of how electricity was used in each place. Print a sentence at the bottom to tell about the picture.

   Example: "I saw a ________________. It uses electricity."

   Allow time for show and tell when finished. These may be put together to make a class booklet. Choose a title. A table of contents may be added.

GRADE 1, UNIT V, LESSON 2

Title: People Using Energy

Purpose: To give children the opportunity to discover how energy is helpful to them in their homes

Materials: Manila paper 18"x24", crayon, pencils.

Procedure:

1. Ask: When we went on our energy tour, did you see some other ways of using energy besides electricity? (sound energy - bells; gasoline - mower, buses; food energy - physical education class) Can you think of another place where energy is helpful to us? (home) How is energy helpful in our homes? (As children suggest, teacher writes suggestions on board.)
2. Distribute manila paper. Have pupils fold it in half lengthwise and crosswise. Label each box as a living room, a kitchen, a bedroom, a bathroom.
3. Ask students to take the paper home and draw as many energy helpers in each room of their house as they can and to encourage their parents to help.
4. Bring the drawings back and discuss.

GRADE 1, UNIT VI, LESSON 1

Title: How Much is Enough?

Purpose: To suggest ways in which students can use energy wisely

Procedure: After developing this lesson, ask the students which appliances were being used in their homes. Discuss if they really need to have all the appliances they found. Have them decide whether each appliance is necessary and list under a heading on the board as:

Needs	Wants
lights	T.V.
water	radio
furnace	toaster
stove	hair dryer
refrigerator	clothes dryer
washer	electric blanket
	electric coffee pot

Say: If we are not careful, the energy all these users are taking will be used up. Can you think of some ways we can save when we use these helpers? Discuss and accept the suggestions which are given.

Say: Suppose the electricity in your community has been shut off until further notice. And suppose everyone in your family is in good health and there is plenty of food in the house. You should not have any problems. Right, or wrong?

Say: Without electricity how would you and your family:

Cook your food?
Wash the dishes?
Open a can?
Make toast?
Bake a cake?
Store food in summer?
Store food in winter?
Wash the clothes?
Keep warm in winter?
Have light in your house?
Entertain yourselves?
Get to the 6th floor of a building?
Get a weather report?
Communicate with a friend across town?

Title: Going Without Energy

Purpose: To discover that energy supplies are limited and must be conserved

Materials: Plastic bag, crackers, drawing paper, crayons, pencils

Procedure:

1. Place two crackers in a plastic bag. Let the class examine the crackers. Then have a number of children eat up the crackers. Look again at the plastic bag. All the crackers that were in the bag are gone. Those two crackers are gone forever.
2. Say: In a similar way, we have a certain amount of coal, oil and gas on the earth. When we use it up, it is gone forever. We say that that our coal and oil and natural gas are nonrenewable. Once they are used up they are gone forever.
3. Say: Let's think of some ways we can conserve energy. (Children suggest ways) The teacher lists ways on chalkboard.
4. Have the children draw pictures showing a way energy can be conserved. Put pictures into a class booklet or display them on a bulletin board.

GRADE 1, UNIT VII, LESSON 1

Title: Wild Animals Need Energy

Purpose: To discover that animals depend on their environment to supply their energy needs - food, shelter

Materials: Library books, picture books about animals

Procedure:

1. Name some wild animals and discuss where they live and how they get food to eat. Make a chart telling the animal's name, the name for the young, where he lives, and what he eats to grow big.

Animal	Young	Home	Food
deer	fawn	woods	plants
frog	tadpole	pond	flying insects
polar bear	cub	cold regions	fish
rabbit	bunny	woods	grass, plants
skunk			
turtle			
bluejay			

2. Write a story.

(Sample Story) ANIMALS NEED ENERGY

All animals need food. Some animals eat plants. Some animals eat other animals. Some animals eat plants and animals

They all need food to grow.

GRADE 1, UNIT VII, LESSON 2

Title: I Can Help

Purpose: To give the children the opportunity to discover they, too, can help their parents save energy in their home

Materials: Checklist copied

Procedures:

1. Copy the checklist below and distribute to the class on Friday.
2. Ask the children to take the checklist home for a week to keep track of the conservation activities that they and their families do to save energy.

Note: Lower thermostat if checklist is used in cold weather - raise thermostat if checklist is used in hot weather.

Save Energy	Sat	Sun	Mon	Tues	Wed	Thurs	Fri
Lower Thermostat							
Less Car Trips							
Pull Drapes							
Turn off Faucets							
Turn off Lights							
Keep Door Closed							
Keep Refrigerator Closed							
No Television							
Take Shower Bath							

3. Have students bring the checklist back to class on Monday after having kept records for a week. Review checklist and discuss results.

GRADE 1, UNIT VII, LESSON 2

Title: I Can Help

Purpose: To understand how electricity is used in the school and how it can be saved

Activity:

1. Invite the school custodian to come into the classroom to explain how electricity helps him to do his work in the school. Ask him to explain how his work would be different if he didn't have "electric helpers". Ask him to specify the main uses of electricity in the building. What plans have been made by him and the school principal to save electricity?

2. Ask the custodian to plan with the children as to how they can save electricity or other energy in their particular classroom. Suggest to him that they would like to have him visit their classroom every week for a few minutes to tell them how their classroom and the school is doing in its efforts to save electricity and other forms of energy.

GRADE 2, UNIT I, LESSON 1

Title: Energy Makes Things Grow

Purpose: To discover that energy makes living things grow

Procedure:

1. Look in magazines to find pictures of young and adult animals. Cut out and paste on manila paper.

2. Label each animal as: colt, horse   cub, bear
   calf, cow   kid, goat

3. Do some research to find what each animal eats.

4. Write a sentence under the picture to tell how each animal grows. Include birds, insects, water animals.

GRADE 2, UNIT I, LESSON 2

Title: Send Your Energy Over A Long Distance

Purpose. To discover that sound travels (Sound is a form of energy.)

Materials: String, tin cans and aluminum cans with one end cut out, wire, nail or punch

Procedure:

1. Make at least four "telephones" - tin cans with string
   tin cans with wire
   aluminum cans with string
   aluminum cans with wire

   Push a hole through the bottom of two of the same kind of can. Tie a connecting string or wire (6 feet long) through the bottom of each can.

2. One child speaks into one can. Another child holds the other can to his ear. Compare the sound using tin cans and aluminum cans, wire and string.

3. Have the children try to explain what happens as the "telephone" is used. (The sound of the voice causes the air to vibrate. The vibrating can causes the string to vibrate. The string causes the can in your friend's hand to vibrate. The vibrating can produces vibration in the air next to your friend's ear. Thus the vibrations are carried to your friend's eardrum.)

4. Teach good telephone manners. Have fun with "telephones."

GRADE 2, UNIT II, LESSON 1

Title: A Ray Of Light

Purpose: To discover that light travels in a straight line

Materials: Flashlight, straws

Procedure:

1. Say: We found out that sound can travel from one place to another. Do you think light travels too? Can it go around corners? Can it go through things? Let's use the flashlight to see how light travels.

2. Choose a child to stand around a corner of a door or cupboard and another to try to shine the light on the child without moving from his place. He may shine it up or down, back and forth.

3. Ask: Why can't the light go around the corner? What happens when the light is turned up? Down? What happens when you stand in the sun? Does the light go through you? (No, you stop the light and make a shadow.)

4. Give each student a drinking straw. Let them look through the straw to the light bulb. Wherever they stand or sit, the light travels straight through the straw. Bend the straw. What happens? Help them understand light travels in all directions but always in a straight line.

GRADE 2, UNIT II, LESSON 2

Title: Where Energy Comes From

Purpose: To discover some different forms of energy that society uses every day

Materials: Old newspapers, scissors

Procedure:

1. Have children cut out pictures from newspapers showing different forms of energy used by their families in their daily lives.

2. Organize the pictures into a bulletin board display.

3. Discuss the energy source of each picture. Discuss which source seems to be most prominent in our society.

4. Also discuss energy waste and ask for suggestions of how to waste less energy.

Title: Energy Goes From Place To Place

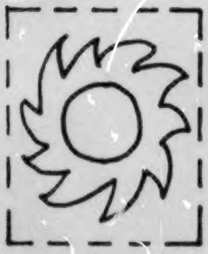
Purpose: To discuss the relationship between where energy is found and where it is used

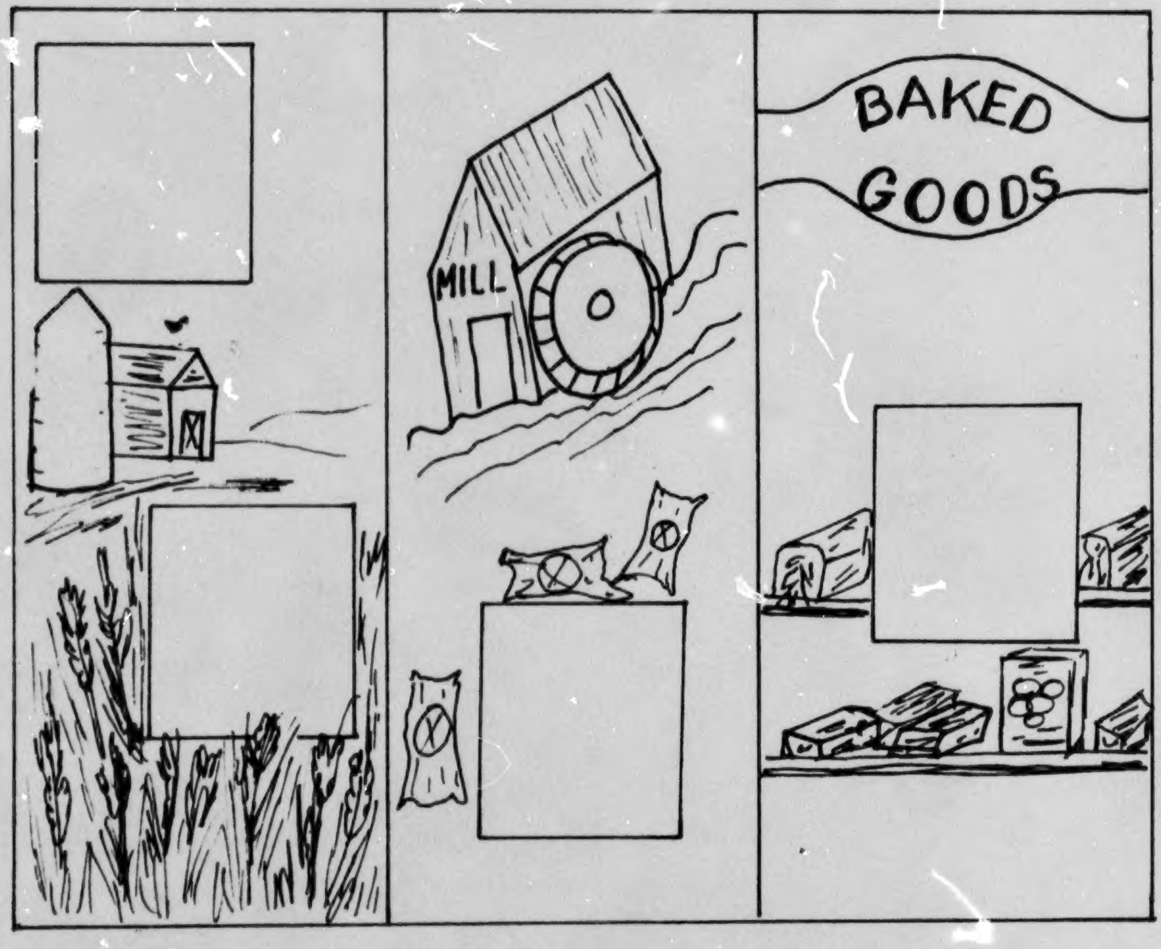
Materials: Reproduce sheet of "Food Chain Stamps" (on next page), crayons, scissors, paste

Procedure:

1. Color stamps and pictures. Cut out stamps and paste in proper picture to show how energy from the sun changes into energy for our bodies.
2. Discuss how energy moves from one place to another.
3. Write the story in sequence.

FOOD CHAIN STAMPS:





Title: Give Some Energy To Someone Who Needs It

Purpose: To recognize that when food is digested it becomes a source of energy and that we need more energy when we are more active

Materials: Empty cereal boxes showing different kinds of grain (wheat, oats, corn, rice)

Procedure.

1. Discuss different kinds of cereals and where they come from.

2. Develop the lesson by asking:

   a. Do you eat cereal in the morning?
   b. Why do you eat it? (gives energy)
   c. What other foods give energy? (several different kinds)
   d. When you eat food, do you think about how your body changes it into energy?
   e. What do teeth do to food? (breaks up into smaller pieces)
   f. Where in our bodies is food changed? (mouth, stomach)

3. Say: Show me where your stomach is.
   Ask: What happens to food in there? (that's where the food gets changed to chemicals that go to the cells all over your body, where it's changed into energy.)

4. Say: Find your heart, and feel it beat. You will need to remain very quiet. When you feel it beat, stand up. (Conclude this part when most of the children are standing.)

5. Say: Let's do some jumping jacks together. (Do at least ten.) Now sit down and find your heart again and feel it beat.
   Ask: Is it beating slower or faster than before?
   Did you use more food energy when you were jumping?
   When you use up most of the food energy your body has stored, what do you think happens? (You feel hungry, and you know it's time to eat again.)

6. Pass out newsprint folded in half, crayons, and pencils.

7. Say: Think about your favorite food. On the left side of the paper, draw a picture of yourself eating your favorite food. On the right side of the paper, draw something you can do with the energy from that food. (run, jump, etc.) If you can, write a sentence about your pictures.

8. Use the pictures for a bulletin board or language experience chart, or let the children take them home.

GRADE 2, UNIT IV, LESSON 1

Title: The Sun Affects Our Lives

Purpose: To understand that the sun is our main source of energy

Materials: Writing paper, drawing paper, crayons

Procedure:

1. Discuss ways the sun helps the students.
2. Have each student write a story of how the sun helps him and draw a picture about his story.
3. Have each student read his story to the class.
4. The class should draw the conclusion: the sun is our main source of energy.
5. Put all the stories in a class booklet and choose a good title.

GRADE 2, UNIT IV, LESSON 2

Title: Energy From The Wind

Purpose: To give the children the opportunity to discover the relationship between energy and the wind

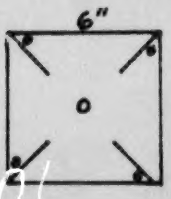
Materials: Milk cartons, pinwheel pattern, paper clip, paper.

Procedure:

1. Discuss some things that are moved by the wind. Talk about the work of windmills, which farmers once used for help on the farm. Make some windmills. Give each child a copy of the pinwheel pattern. Cut it out and fasten it together with an unbent paper clip. Cover the milk carton with construction paper. Color doors and windows on this mill house. Fasten the wheel to the top front of the house by inserting one end of the paper clip into the top of the roof.

2. Have a child blow on the pinwheel. Explain that in a real windmill the turning wheel would turn some machinery to do some work. (perhaps draw water from a well or grind some corn)

3. Ask: Does your pinwheel move if you don't blow on it? (Air currents in the room may cause it to move.) Blow gently on your pinwheel. Does it move slowly or fast? Blow a little harder. Does your pinwheel move slower or faster? Who can make a rule about the pinwheel? (The harder you blow on it, the faster it turns.) What are you using to turn the pinwheel?



Give students 6" squares of paper.
Cut in from each corner 3".
Put clip through each dot on corner of the 6" square.
Attach to mill.

GRADE 2, UNIT V, LESSON 1

Title: My Energy Use

Purpose: To give children the opportunity to discover that they use energy many ways in their daily lives

Materials: Butcher paper, crayons

Procedure:

1. Have the students draw an energy picture showing how they use energy in different rooms of their homes.

2. Using their ideas, make lists on the board of how energy is used in each of the rooms in a home.

Living room	Bedroom	Kitchen	Bathroom

3. Have students copy the lists from the board and then check the ways energy is used in their homes.

4. Discuss ways energy can be used wisely in the home.

GRADE 2, UNIT V, LESSON 2

Title: My Class Uses Energy

Purpose: To give children the opportunity to discover the many uses of energy in their school

Procedure:

1. Assign groups of children to interview the custodians, lunchroom workers, librarian, principal, and a bus driver to find out how energy is used in various places in the school.

2. Prepare questions children should ask the people to be interviewed and conduct mock interviews.

3. Have students conduct interviews and make oral reports on their findings.

Title: Energy Is Lost

Purpose: To help understand that fossil fuels are nonrenewable

Materials: A large box for a diorama, clay, crayons, construction paper, coal (or simulated coal), sample of oil

Procedure:

1. Review the sun as a source of heat.
   Say: The sun has been shining on the earth for a long, long, long time. (Add as many "longs" as you think necessary to help children grasp the concept of millions of years.)
   Ask: Who can tell me the name of an animal that lived a very long time ago - an animal that is not alive today? (dinosaur)
   What did dinosaurs look like? (very big, some had horny plates on their backs, etc.)

2. Give each child a piece of clay. Have each child make a dinosaur for the diorama. Let the children who finish first make trees and other plants for the diorama and arrange things to illustrate a prehistoric scene.

3. The scene can be used to stimulate a discussion about fossil fuels by saying: Millions of years ago, this is what the earth may have looked like. What happened when these plants and animals died? (They got pressed down and other plants and animals grew on top of them.) All of this pressing down went on for a long time (millions of years) and from it we get this. (Hold up coal) What is this? (Have children name it, feel it, look at it closely)

4. Say: From the animals and plants that lived a long time ago (you may wish to mention the word fossil at this time) we also get this. (Pass around a glass container of oil. Let the children look at it closely.)

5. Say: There is another source of energy that comes from plants and animals that lived a long time ago. We can't see it any more than we can see the air around us. But we know it's there because it will burn. This source of energy is natural gas. It is as old as coal and oil. (Point to diorama) We can't see natural gas but we can see the flame that comes out when we turn on the gas burner on the stove. We have to burn natural gas to see the flame. What do we have to do to coal to make the energy come out? (burn it) To oil? (burn it) Once these fossil fuels are used, they are gone forever - there is not any way to get them back.

Title: Not Enough Food

Purpose: To realize that in some places food energy supplies are scarce

Materials: Pictures of children living where food is very scarce

Procedures:

1. Collect pictures showing hungry children.
2. Show the pictures and discuss why their bodies are not developed properly.
3. Ask the children to make a list of how they think they could prevent a scarcity of food.

   Examples: Take only what you can eat.
   Plant a garden and take care of it.
   Don't eat between meals.
   Don't throw food away.

4. Have children keep a food diary for a day that includes everything they eat and drink. Have them decide which foods they would not eat or drink if they could have only one-half as much; one-fourth as much.

GRADE 2, UNIT VII, LESSON 1

Title: Transportation In My Life

Purpose: To discover the different kinds of energy used to move people from place to place

Materials: Pictures showing methods of transportation

Procedure:

1. Discuss the kind of energy used for each method of transportation. (walk, horse, bicycle, car, bus, boat, airplane, helicopter, train, monorail, subway, motorcycle)
2. Discuss which is best to use to save energy according to the needs of society.
3. Cut out pictures and use for bulletin board or booklet.

GRADE 2, UNIT VII, LESSON 2

Title: Energy Feelings

Purpose: To discover our lifestyles have changed due to changing energy sources

Procedure:

1. Make a list on the board of our energy helpers and our great-grandparents' energy helpers. Have children copy the list.

Our Energy Helpers	Great-Grandparents' Energy Helpers
Car	____________
Refrigerator	____________
Faucet	____________
__________Stove	____________
__________Heating	____________
Television, radio	____________
Automatic Washer	____________
Automatic Dryer	____________
Dishwasher	____________
Electric Sewing Machine	____________
Vacuum Cleaner	____________
Lawn Mower	____________
School Bus	____________
Electric Lights	____________

2. Have students take the list home and ask their grandparents or an older person how energy helpers in earlier times compare to energy helpers now. Discuss in class.

GRADE 3, UNIT I, LESSON 1

Title: Energy Being Used

Purpose: To understand how energy is used by people in different occupations, jobs, and careers (including sports)

Materials: Construction paper, scissors, glue, newspapers, magazines

Procedure:

1. Collect pictures of people doing various jobs.
2. Make an occupation collage using pictures.
3. Make a list of careers and services.
4. Discuss the amount of time needed to complete each person's job. (Doctor performing an operation, football player playing a game, teacher's workday, etc.)
5. Categorize amounts of energy used for each occupation. (Does a football player use as much energy as a golfer?)
6. Simulate some careers and discuss the effects of energy being used. (How tired is this person?)
7. Have each student choose the job that he thinks he would like to have and write a story about "A Day In My Life As A__________."

GRADE 3, UNIT I, LESSON 2

Title: Energy Can Change Things

Purpose: To demonstrate and observe a change

Materials: Chalkboard, water, sponge

Procedure:

1. Wash part of the chalk board.
2. Time how long it takes to dry.
3. Wash another section.
4. Fan it with a piece of cardboard.
5. Compare drying time.
6. Discuss why one dried faster.
7. Discuss why laundry dries.
8. Experiment: Place some water in a dish. Mark the level of the water. After a few days, mark the change. Discuss what happened to the water.
9. Draw a simple water cycle.

GRADE 3, UNIT I, LESSON 2

Title: Energy Can Change Things

Purpose: To teach kinetic energy (energy in motion)

Procedure:

1. Have a student draw a picture of a sailboat on the chalkboard. Have another student draw a picture of a bulldozer.
2. Ask: When a sailboat is moving, is it working? (Yes) How?
   When a bulldozer is digging, is it working? (Yes) How?
3. Say: Objects or matter in motion have energy. THE ENERGY IS IN MOTION. Here are some examples of things in motion: running water, bulldozers moving soil, a boat sailing.
4. Say: Scientists have a special name for energy that is in motion. This is called KINETIC ENERGY. They say that moving matter has kinetic energy.
5. Have students give other examples of things having kinetic energy.

GRADE 3, UNIT I, LESSON 2

Title: Energy Can Change Things

Purpose: To understand that energy can be stored and that stored energy is called "potential energy"

Procedure:

1. Have a student draw a picture of a battery on the chalkboard. Have another student draw a picture of a gasoline pump.

2. Say: Energy is not always in action. Energy can be stored. Can you think of an example of stored energy? (A battery that runs a radio or starts a car has stored energy. Gasoline is stored energy used in an engine to do work.)

3. Say: Another name for stored energy is POTENTIAL ENERGY. A wound watch spring has potential energy. It can do work as it returns to its original shape.

4. Ask: Does a stretched rubber band have potential energy? Can it do work when it goes back to its original shape?

5. Say: Water at the top of a dam has potential energy (STORED ENERGY) because it can do work if it falls. Ask: Does a boulder on the edge of a cliff have potential energy? Say: You may not like the work it could do if it fell.

6. Say: In these examples, the object has potential energy because of "where" it is. Can you think of other examples?

   As you can see, an object can have potential energy because of "what" it is (fuel) or "where" it is.

GRADE 3, UNIT II, LESSON 1

Title: Food Has Energy

Purpose: To demonstrate that seeds and bulbs contain baby plants

Materials: Seeds, bulbs, knife

Procedure:

1. Cut open several seeds to find the baby plants.
2. Cut a bulb in half and find the small plant.
3. Discuss seeds and bulbs having stored energy.

GRADE 3, UNIT II, LESSON 1

Title: Food Has Energy

Purpose: To uderstand that producers and consumers are parts of a food chain

Procedure:

1. Say: In nature, each member of the plant and animal community helps another member. The community is in balance. A food chain is one way nature maintains a balanced community.

2. Say: The food chain begins with a green plant, because only green plants can produce their own food. This process is called photosynthesis. Plants get the energy to produce food from the sunlight. Plants are called PRODUCERS.

3. Say: An animal eats, or consumes, the plant. The animal is called a first consumer. Another name for first consumer is HERBIVORE, which means plant-eater. They get their energy from plants, and plants get their energy from sunlight. Food chains show how energy flows.

4. Name some plant producers. List first consumers of these plants.

PRODUCERS	FIRST CONSUMERS
carrot	rabbit
grass	cow
nuts	squirrel

4. Draw a picture on the board of a carrot and a rabbit.

5. Say: Now we have two links to the food chain. The plant is eaten by the first consumer. Energy flows from the carrot (producer) to the rabbit (first consumer). What would eat the rabbit to be a second consumer?

6. Draw other food chains.

Title: An Energy Mobile

Purpose: To discover what seeds and bulbs need to grow

Materials: Pictures of seeds and bulbs, string, wire and coat hanger

Activity: Making an energy mobile

Procedure:

1. Cut out picture of bulbs and seeds.
2. Cut out pictures of full-grown plants.
3. Draw or cut out a picture of the sun.
4. Draw or cut out a picture of rain.
5. Construct a mobile using wire and coathanger.
6. Attach each picture to an arm of the mobile.
7. Discuss how bulbs and seeds need sunlight, water and soil to grow.

GRADE 3, UNIT III, LESSON 1

Title: Getting Heat And Light

Purpose: To show that the position of the sun determines the times of sunrise and sunset on the earth

Materials: Globe, flashlight, chart paper

Procedure:

1. Record the times of sunrise and sunset for a week. (use information from the newspaper)
2. Show that the earth is constantly turning by using the globe.
3. Demonstration: Darken the room. Place chart paper where globe will be between paper and flashlight. Use the flashlight to represent the sun. Hold it over the globe. Notice the shadow cast by the globe.
4. Slowly rotate the globe to show day and night. The sun's energy is the light or day.
5. Simulate sunrise and sunset with the approximate times that the students have observed and recorded.
6. Discuss that heat and light come from the sun.

GRADE 3, UNIT III, LESSON 2

Title: Predict An Energy Change

Purpose: To simulate a television weather prediction

Materials: Pictures of cloud formations, cardboard box for making T.V., map of the United States.

Procedure:

1. Collect pictures of cloud types. (cumulus, sirrus, and stratus) Gather and compare information about each type.
2. Make a T.V. set using a cardboard box. Attach a map of the United States on the T.V. to use for making weather reports.
3. Give students a homework assignment to look at T.V. weather reports. Discuss weather reports next day.
4. Have students act as weather persons.
5. Predict weather changes using information gathered concerning cloud formations, rate of movement, and related conditions.

Title: Predict An Energy Change

Purpose: To teach awareness of how energy is processed or transformed and to teach the concept of transformation

Procedure:

A. Begin this lesson by helping students to think about something that is actually transformed from a raw resource into a product and then used. They need not learn these terms at this time. You might want to discuss with students the making of something like oatmeal cookies. Normally people make cookies from ingredients, such as oatmeal, flour, and eggs. They use a recipe which tells them what to do in order to combine those ingredients (or process them) in a way that they become a product, the oatmeal cookie.

Oatmeal Cookies (Moist)

1½ cups brown sugar (or part honey)
½ cup shortening
1½ cups oatmeal
2 eggs
1 tsp. soda dissolved in ¼ cup hot water
1½ cups whole wheat or white flour
½ tsp. salt
½ tsp. cinnamon
1 cup raisins boiled in a small amount of water

Mix shortening, sugar, and eggs thoroughly. Add oats, dry ingredients, and soda. Add raisins. Drop by teaspoonfuls on cookie sheet. Bake at 350° for 15 minutes. Makes approximately two and one-half dozen.

Talk with students about the oatmeal cookie example. Ask students the following questions.

1. What ingredients are used in making oatmeal cookies? Where are these ingredients normally found? (Ingredients are oatmeal, brown sugar, flour, raisins, eggs, etc. They are normally found in the grocery store, or in the kitchen of someone's home.)

2. How are cookies made out of these ingredients? (The ingredients are combined and beaten; the cookies are then baked in the oven.)

3. What product is made as a result? (The product in this case is the oatmeal cookie.)

4. How is the product used? (We normally eat it, either quickly or over a longer period of time. We use it for energy to play, learn, etc.)

B. Tell students that the process of using energy is much like the process of making oatmeal cookies. There are ingredients, or sources of energy. We work with those sources in order to make an energy product, such as lighting or heating. We then use that product in various ways. Ask students to list what energy ingredients or sources they are familiar with. The list should include coal, oil, water, wind, solar energy, and others that students can think of. Make the list as comprehensive as necessary to meet the needs of the students. We merely want students to be aware of vast arrays of energy sources which are available to be processed into an energy product.

C. Ask students to find a set of pictures in magazines, newspapers, and other places, which show energy sources. When students have selected their pictures, discuss with students in class and identify sources on their list that correspond with the pictures.

D. Now ask students to look again at their list and ask them how these sources are processed in order to make the energy products that they see around them every day. Talk with students about how coal, for example, is found in the ground. It is mined, and then transported via trucks or rail to processing plants which transform coal into electrical energy or use it for heating purposes. Again, it is not important for students to know the exact process at this point, but to select a few energy sources from their list and to know that a process does exist which involves the transformation of the source into the energy product that they see in their home, community, or school.

E. Ask someone (such as a parent involved in energy production) to come into the classroom and talk about an energy product that the students are interested in. Have that person describe, for example, how coal or oil is processed, and how it is used in their community; or

Have students do a survey of their classroom, school, or homes. Have them determine one of the energy products in these places, and have then study how this product came into their homes or school or classroom.

F. Now talk with students about the processing or transformation of energy results in an energy product. Energy products are all around us, from the pens and pencils we use to write with and the paper we write on, to the lights we use to see by. Have students do another list of energy products that they use every day and that are commonly used by people in the United States. Then talk with them about their original list of sources and their list of products, using the following questions.

1. What sources are the base for the product that you have listed?

2. How generally are these sources transformed into products?

3. Why is it important to have these energy products?

G. Now talk with students about how energy products are used. Oil, for example, is used for cars, home heating, and other activities. Make a list with students of the major ways in which the products they have listed are used in their school, homes, and/or community.

H. Put the word "transformation" on the board. Ask students to summarize the ways energy is transformed, and tell them that transformation consists of four parts. The first is the sources, or ingredients, that are used. The second is the process of transformation. The third is the product that is produced. The fourth is the use that is made of that product. Have students take several of the energy sources that they listed in the beginning and trace the process of transformation. You should see that students understand the concept of transformation and how important it is to understanding energy and energy use.

GRADE 3, UNIT IV, LESSON 1

Title: I Can Enjoy the Sun's Energy

Purpose: To use the sun's energy to make "Sun Tea"

Materials: Glass "Sun Tea Jar" bought at local supermarket (or glass jar from cafeteria), tea bags, tap water.

Procedure:

1. Fill the "Sun Tea Jar" with regular tap water.
2. Deposit appropriate number of tea bags in the jar.
3. Place the "Sun Tea Jar" in the sunlight.
4. Pre-test the water temperature at the beginning of the experiment and again after the brewing period for comparison of temperature changes.
5. Observe the time required for water to heat, and for the tea to steep.
6. Discuss the difference the students notice in the taste from conventionally brewed tea.

GRADE 3, UNIT IV, LESSON 2

Title: The Sun's Energy Affects My Environment

Purpose: To discover the effect of the sun's energy on the growth of plants under light and dark conditions.

Materials: 2 shoe boxes, aluminum foil, 4 inches of soil, plant seeds

Procedure:

1. Line each shoe box with foil.
2. Put two inches of soil in each box.
3. Let children scatter the seeds in each box, and cover the seeds with ½ inch of soil.
4. Place one shoe box in a sunlit window, and the other in a darkened closet.
5. Observe, over a period of time, the growth rate of each plant.
6. Discuss the effects of the sun's energy on each plant before, during and after germination.

GRADE 3, UNIT V, LESSON 1

Title: My Energy "Wants"

Purpose: To distinguish between the material things that supply our energy needs, and those that satisfy our energy "wants"

Materials: A camera and film

Procedure:

1. Prepare students for a school science walk.
2. Walk about school campus and ask students to identify all the things they see that use energy.
3. Take a picture of each item students point out.
4. Having developed the pictures, make a classroom bulletin board.
5. Have students identify the things that we need energy for, and those things we want that require energy.
6. Discuss the difference between needs and wants.
7. Decide, as a class, how we can live without some wants.

GRADE 3, UNIT V, LESSON 1

Title: My Energy "Wants"

Purpose: To extend students' awareness of environmental energy through a study of their homes, and to develop skills for asking questions

Procedure:

A. Discuss with students the idea that environmental energy is also found in their homes. Ask them to tell you what room in their house they use the most for sleeping, dressing, playing.

B. Ask students to draw a picture of the room they use the most in their home for sleeping, etc. They can take the pictures home and have their family help them. Ask them to think about (and include in their drawing) some energy-consuming objects they use every day.

C. Discuss the students' pictures in class, using the following questions to reinforce students' knowledge about energy in their homes:

1. What energy can you find in your home? (i.e., lights, etc.)

2. What energy do you use every day? (i.e., most of what they mention in #1)

3. Why is home energy important? (i.e., we use it for play, dressing, sleeping, etc.)

D. Tell students that to learn more about energy they use in their homes, they need to be able to ask questions. Suppose they wanted to find out more about energy in a classmate's home. What questions would they ask?

Work with the students to put a series of questions on the board. Three to five questions will be fine. The students' questions should not be criticized at this point. The class should just discuss what possible questions they think would be most important to ask one of their classmates about energy they use in a room at home.

E. You should now teach students about important question-asking skills. You can use the questions that have been put on the board as examples. Have them try to determine which questions are the best questions, in terms of getting important information about energy in their classmate's home.

There are two important parts of good question-asking. The first is that a question should be clear. You should be able to show students how some of their questions are clearer than others, more direct, more to the point, more precise. These questions are better to ask than more vague questions, because they help to get better information.

A second part is that a question should be related to the problem that students are trying to study or the information they need. For example, if a student asks for the number of people in a family, this question is not necessarily directly related to home energy use. If the students ask questions about the energy use in their bedrooms, then they are asking directly related questions.

Students should then develop two or three more questions which they think will meet the idea of good questions about energy in their classmate's home.

F. Now, break students into pairs. Tell them they want to find out as much as they can about energy and how their classmate uses it in his/her room. Have them ask questions to find out. They should then draw a picture of their classmate's room and the energy that is used based on the answers they get. They can ask more questions as they draw.

G. When students have finished their pictures, conduct a class discussion using the following questions as guides. Put the words "home energy" on the board. List students' responses to question #1 under the words.

1. What kinds of home energy did you draw? (i.e., lights to help us see)

2. What questions helped you to get the most information for your picture? (i.e., those that were clear, related)

3. Why do you think asking questions is important to find out about energy? (i.e., you can get more information, you can get new ideas)

H. Now ask students to think about the energy they use in their rooms at home, and the energy their classmates use. Ask them to bring to class one energy object from home which they use a lot (every day). Have them talk with their family about the choice. In class the next day, have the students show their objects to the class. Have them explain how and why they use the object a lot. Have the class ask questions (clear, relevant ones) about the student's energy use.

I. Then remind students that it is important to take care of energy. Ask them how they might take care of the energy object they brought to class. Ask them to try to take care of it for one week. During the week, talk with students about how they are doing. Help them to see how taking care of energy is important.

GRADE 3, UNIT V, LESSON 2

Title: I Waste Energy

Purpose: To demonstrate the neglect and waste of resources and energy we commonly take for granted

Materials: Garbage

Procedure:

1. Prepare students for a school scavenger hunt.
2. Have students collect and sort different kinds of trash from school wastebaskets.
3. Have students identify the items that are most often wasted. (paper, pencils and/or crayons, etc.)
4. Discuss how these resources can be better conserved, or recycled.

GRADE 3, UNIT V, LESSON 2

Title: I Waste Energy

Purpose: To develop students' understanding of how they use energy, and how they can conserve energy

Procedure:

A. Ask students to think about things they waste every day. (food, crayons, paper) Put the word "waste" on the board. List students' examples under it. They should see that waste is part of their everyday lives, and involves poor use of things. Ask them to compare the ways they waste things to the ways they could save, or conserve, things.

B. Talk with students about how they also waste energy. Use the list you have made on the board to talk with students about how some of their items involve wasting energy (i.e., food energy, paper energy). Add some items that students suggest that involve energy waste.

C. Help students to more fully see ways that they waste energy. (They throw away things they could use, or others could use again.) Explain to students that food can be saved, as can crayons.

Other items can be recycled. Used paper can be reused if it is collected, processed, and made into new paper. The same is true for cans and bottles. Ask students to bring in one item from home that could be recycled. You should bring comparable recycled products to class for discussion.

When students bring their items to class, talk with them about how they waste these items, and how they can be recycled. You may want to have someone from a recycling center come to class to talk about what is recycled, how it is done, and how important it is to their community.

D. Ask students to draw pictures or act out ways they waste an energy product and how it can be saved or recycled.

E. Students should then study the Energy Waster Questions below. The questions are divided into three parts, including shopper, user, and disposer roles. The list should include a set of questions which pinpoint energy waste. The two questions under each category indicate possible Energy Waster Questions that students could use.

ENERGY WASTER QUESTIONS

Shopper:
1. Do I really need this product?
2. Is it best to use this product or another product?

User:
1. When do I need to use this energy?
2. How much energy do I need to use?

Disposer:
1. Do I need to throw this away, or can I use it again?
2. Can this be recycled?

Discuss the Energy Waster Questions with students. See if they think they cover all of the dimensions of possible energy waste for them, and for their community. Add or substitute questions developed by students.

F. Students should then give themselves a self-check in class, as small groups, or as individuals on the Energy Waster Questions. They should take a product, such as electricity, cars, home heating or school lighting, and determine answers to the questions. Do they really need to use lights? Is it best to use the lights all the time? They should continue with these questions and determine whether or not there is wastage in the areas of shopping, using or disposing of energy for the product they have selected.

G. Now ask students to select one form of energy they think they use a lot. (i.e., food, family car gasoline) They should get information (self-reports, observation, a log) about their use of this form of energy. They should then determine answers to the Energy Waster Questions. Have them bring their information and answers to class.

When students have finished collecting their answers, discuss them in class using the following questions:

1. What energy did you waste?

2. How did you waste that energy? (i.e., shopping, using, disposing)

3. How can you try to save energy? (i.e., recycling, using again, using less, using less often)

4. Why is saving this energy important? (i.e., saves money, saves energy for everyone)

H. Ask students to try to be more careful of energy based on their answers to Questions #3 above for one week. Talk with them about their progress in saving this energy as they try to carry out their ideas.

GRADE 3, UNIT V, LESSON 2

Title: I Waste Energy

Purpose: To recognize good and bad habits and to change wasteful habits

Procedure:

A. Students have seen how they perform consumer roles in the energy situation and have seen how people can waste or conserve energy. Students should review the essential aspects of their roles as energy consumers and talk about how their good habits fit into the categories of shopper, use, and disposer of energy.

B. Begin the new information in the lesson by having students develop a list of the five or ten worst energy habits that they can think of. This will be the "bad habit" list. Students should reflect on their own lives and what bad energy habits they and the people around them have. This list should be put up next to the list of good habits.

C. Now that students have listed their good and bad energy habits, the question is how to change bad habits to make them good habits. Point out to students that changing a habit is not an easy thing to do. Have them take one of their bad habits, and talk about how hard it would to change it. Perhaps they do not clean up their room, or they do not get along with their sisters or brothers, or they eat junk food all the time. These types of habits can be changed, but it is difficult.

D. Work with students in developing four types of ways that bad energy habits can be changed into good energy habits. There are four ways that habits can be changed. They are: reward, punishment, convincing someone, leading someone.

Draw four pictures to show the methods of changing habits:

1. Show a girl being rewarded for changing a bad habit; for example, turning off the lights.
2. Show a boy being punished in order to change a habit; for example, not closing the door.
3. Show a father convincing his son to change a habit; for example, wearing a sweater so the heat can be turned down.
4. Show a mother leading her son to change a habit; for example, riding his bike instead of using the family car.

E. Discuss with students the possible impact that changing bad habits to good habits can have on the energy problem. Talk with students about how changing habits helps to change entire patterns of energy use. Therefore, for example, if everyone changed a bad habit of not turning off the lights to a good habit of turning them off, the following types of impact could be felt: 1) Everyone could save money, which they could use for other things; 2) Everyone could help the local, state, and national situation, and therefore, there would be more energy for those who need it; 3) Everyone would be happier because the world would be a better place to live, and there would be less tension and conflict over energy resources; 4) People would be taking leadership in something important to everyone.

F. Have students talk about one habit that they, themselves, can change from a bad habit to a good habit. Have each student list a bad habit he/she would like to change. Each student should work with another student who will monitor their progress and help them to change the bad energy use habit.

G. Have the students report back to class either orally or in written essays about their changes in their energy habits. Have them talk about the impact that this can have on the energy situation.

Title: A Movement I Enjoy

Purpose: To give children an opportunity to discover shadows and how they relate to the position of the sun

Materials: Chalk

Procedure:

1. Take students outside to a sunny area. Observe how their shadows fall according to the sun's position.

2. Observe objects that cast shadows.

3. Determine the rule for the relationship of the position of the sun to the length and position of shadows.

4. Choose an object (or objects) and mark the position of its shadow on the ground or paved area with chalk.

5. Play a game of "shadow tag."

   (Have students select a partner and take turns trying to step on each other's shadow. The person who is "it" steps on the other person's shadow.)

6. Record the changes in length and position of the marked shadows after playing "shadow tag". Check on the position of the shadows at intervals during the school day.

7. Play another kind of "tag". Use shadows cast by trees, buildings, poles, etc. for bases.

GRADE 3, UNIT VI, LESSON 1

Title: Show How Energy Is Scarce

Purpose: To define the concept of scarcity

Procedure:

1. Establish a hypothetical situation - "What if?"
   Problem: The class is required to have a Rubic's cube, but the only store in town with Rubic's cubes has just sold out. One student purchased enough cubes (from out-of-town) to supply the class. However, the student has raised the price $1.00 per cube. If the remainder of the class is to meet the course requirements by the deadline, they must pay his price.
2. Discuss how the limited supply, and the pupil demand for the cubes, influenced the price.

GRADE 3, UNIT VI, LESSON 1

Title: Show How Energy Is Scarce

Purpose: To make energy priority judgements

Procedure: Read or prepare copies of the following story situation:

Oak Dale had already experienced one gasoline shortage this past year. Another shortage appeared to be near at hand. The first shortage had been a nightmare. People had to wait in line for six hours or more just to get ten gallons of gas! People were late to work, they ran out of gas, and they used their automobiles only for the most necessary errands. During this crisis, no one wanted to use a drop of this precious fuel (gas) in a wasteful manner; not even to drive to the corner to get a soda or ice cream cone!

As a result of this gas shortage (and the trouble caused to everyone by the shortage) the City Commissioners decided to work out an emergency plan which they felt would be fair to everyone concerned. The Commissioners knew there would not be enough gasoline to fill all the cars in Oak Dale. They must decide which cars would receive gas first, how much gas to give each driver, and whether or not to give some people any gas.

Have the students rank or number the following people in the order which they think should receive gasoline.

____ Tourists travelling through the city, hundreds of miles from home
____ Police cars, fire trucks, ambulances
____ Doctors, nurses, pharmacists and other hospital workers
____ Postman, garbage collectors, taxis, delivery trucks
____ City commissioners, official business, bankers, lawyers
____ People who live long distance from work (commuters)

Title: Show How Energy is Scarce

Purpose: To develop students' imagination to make value judgements

Procedure:

Imagine: Life on the earth was greatly changed when people learned how to get energy out of fossil fuels (first coal, then oil) and use it to do work. We usually take these changes for granted, but let's imagine the following situations and think of what they would be like.

SITUATION A

Before the use of fossil fuels.....

1. What did people do for a living?
2. What did they depend on for a good life?
3. What kind of energy did people use?

SITUATION B.

After the fossil fuels are used up.....

1. What should people use for energy?
2. How should life be different?

SITUATION C

1. Would you like to have lived before the use of fossil fuels? Why?
2. Suppose the fossil fuels are used up. What would your feelings be?

SITUATION D

From the following statements, choose the one you think tells best why people should conserve energy.

1. There should be conservation of energy so that we will be able to explore outer space.
2. The more energy I save, the more money I will save, so I can buy a new trail bike.
3. If we don't conserve energy today, in the future people will not be able to have the things we have now.

GRADE 3, UNIT VI, LESSON 2

Title: Collect "Energy Crisis" Cartoons

Purpose: To allow students to discover the relationship of values in a crisis situation

Materials: Newspapers, magazines and comic books, one shoe box

Procedure:

1. Have students bring in newspaper cartoons, magazines and comic books.
2. Cut out cartoons that pertain to energy and the lack of it (i.e., gas shortage, nuclear power, etc.).
3. Have students make a collage or bulletin board display.
4. Have them identify energy resources they value most; least.
5. Discuss the impact of a crisis situation on these scarce energy resources.

GRADE 3, UNIT VII, LESSON 1

Title: Electricity In My Life

Purpose: To increase students' awareness of their use of electricity in their environment at home and at school

Materials: Paper and pencil

Procedure:

1. Have students think of all the things they do during the day that involves the use of electricial energy.

2. Ask students to keep an "electric diary" for one week. Students are to record each day their uses of energy requiring electricity The diary should cover their personal use of appliances, the length of time the appliances are used, and, if possible, have them estimate the number of kilowatts used.

3. At the end of the week, discuss their use of electrical energy and have them think of ways that electrical energy can be conserved.

4. Have students write a story entitled "Electricity In My Life."

GRADE 3, UNIT VII, LESSON 2

Title: Moving Water

Purpose: To show the relationship of running water and its ability to generate energy

Activity: Making a paddle wheel

Materials: Tinker Toys, a pail of water

Procedure:

To construct and operate a water wheel:

1. Assemble Tinker Toys in the shape of a water wheel.
2. Hold a pail of water above the water wheel and pour the water onto the wheel.
3. Observe the movement of the water wheel paddles as the falling water generates the energy to turn the wheel.
4. State a rule that relates the expending of energy to the speed of the turning wheel.

Rule: The more water falling on the wheel the faster the wheel turns.

VOCABULARY - "ENERWORDS"

Ampere - A unit of measure for electric current.

Appliance - A device which does a special job, usually electric.

Barrel - A liquid measure of oil, usually crude oil, equal to 42 gallons or 306 pounds.

Bituminous Coal - Soft coal, high in volatile matter.

British Thermal Unit (BTU) - A unit of heat energy - the amount of heat necessary to raise the temperature of one pound of water one degree Fahrenheit.

Brownout - The lowering of power supplied to customers by a power company when power demand exceeds generating capacity.

Calorie - A unit of heat equal to the amount of heat necessary to raise the temperature of one kilogram of water one degree Celsius; equal to 1000 small calories.

Carbon Dioxide - A compound of carbon and oxygen formed when carbon or carbon materials are burned or used in the body.

Carbon Monoxide - A compound of carbon and oxygen formed when carbon or carbon materials are incompletely burned. When formed in automobiles, it becomes a major air pollutant.

Catalytic Converter - A device placed on the exhaust of an automobile that changes carbon monoxide and hydrocarbons, which cause air pollution, to carbon dioxide and water.

Centigrade - See Celsius.

Celsius - A temperature scale which runs from zero degrees (the temperature of melting ice) to one hundred degrees (the temperature of boiling water). Sometimes called centigrade.

Charcoal - A porous, solid residue resulting from the incomplete combustion of wood or bone.

Chemical Energy - Energy stored in the structure of atoms and molecules, which can be released by a chemical reaction.

Clean Fuel - A low sulfur fuel.

Coal - A solid organic material formed by the decomposition of plant material without air, containing 75% carbon.

Coal Gas - "Fuel gas", the gas formed when coal is partially burned to make coke. Has 1/3 the energy of natural gas.

Coal Gasification - The process which converts coal to a gas.

Coal Liquification - The process which converts coal to a liquid fuel by the addition of hydrogen.

Coal Tar - A black, gummy substance produced when coal is distilled.

Coke - A porous, solid residue resulting from the incomplete combustion of coal heated in an oven with a limited supply of air. A good fuel, more nearly pure carbon than coal.

Combustion - Burning, a chemical reaction producing heat and light and, in some cases, a flame. Usually a combination of carbon and oxygen.

Conduction - The transmission of energy directly from one substance or molecule to another.

Conserve - To keep from being lost, wasted, or damaged.

Convection - The transfer of energy by moving masses of liquid or gases.

Conversion - The process by which energy is changed from one form to another.

Cooling Tower - A structure for cooling waste water from power plants.

Cord - A measure of wood volume - a stack four feet by four feet by eight feet.

Cracking - The process of breaking down the molecular structure of heavy hydrocarbons into lighter hydrocarbons, as when gasoline is produced from crude oil.

Crude Oil - A mixture of hydrocarbons in liquid form found in underground reservoirs; the raw material from which most refined petroleum products are made.

Depletion Allowance - A tax exemption for a portion of the revenue received from depleting a natural energy resource (e.g., removing oil from a well).

Dry Steam - Steam so hot it contains no water droplets.

Ecology - The study of relationships between living things and their environment.

Efficiency - The ratio of the work or energy output to the energy input to do the work.

Electric current - A flow of charged particles, usually electrons.

Electrons - Negatively charged particles that orbit the nucleus of an atom. A chemical reaction consists of the transfer and rearrangement of electrons between atoms.

Electrostatic Precipitator - A device that removes waste particles from the exhaust of power plants by attracting them to electrically charged plates from which they can be washed away, thus preventing air pollution.

Energy - The ability to do work; to move a force a certain distance. It exists in many forms and can be converted from one form to another.

Energy Density - The energy per unit of weight in a fuel.

Energy Intensiveness - A measure of energy utilitization. For example, the number of calories used to move a passenger one mile.

Environment - Everything that is not you - and you.

Environmental Impact Statement - A predicted analysis of the impact on the environment of a projected activity. For example, the mining of coal, or offshore drilling for oil.

Fahrenheit - A temperature scale which uses 32 degrees as the melting point of ice and 212 degrees as the boiling point of water, named after its inventor.

First Law of Thermodynamics - The law of conservation of energy, which states that energy can neither be created nor destroyed.

Fission - The splitting of atoms (heavy nuclei) to release energy.

Food - The fuel used by animals, including man, to produce "body power".

Food Chain - The pathway over which any food material passes from the producing organism to consuming organisms.

Force - The power exerted on an object to produce motion or change of direction.

Fossil Fuel - A natural fuel such as coal, oil, or natural gas, formed from the fossil remains of living things.

Fuel - A substance that can be burned to produce heat.

Fusion - The joining together of atoms to release energy.

Gasoline - A fuel composed primarily of light hydrocarbons, produced by "cracking" crude oil in a refinery.

Generator - A device which produces electric energy from mechanical energy, as in a motor or water turbine.

Geothermal Energy - Heat energy within the earth which produces steam when it comes in contact with water.

Geyser - A spring from which hot water and steam shoot into the air.

Greenhouse Effect - The warming effect of the carbon dioxide in the atmosphere which allows solar radiation to reach the earth but which absorbs (and keeps in) the heat radiation from the earth.

Harness - To control so as to use the power of, as of steam.

Heat - A form of kinetic energy resulting from the movement of molecules in matter. It flows from one body to another if there is a temperature difference between them.

Heat Engine - A device which converts heat energy into mechanical energy.

Heat Pump - A device which transfers heat from one place to another by using electric or mechanical energy. It can pump warm air into a building to heat it, or out of a building to cool it.

Heat Sink - Any substance that absorbs waste heat - air, water, or space.

Heat Tax - The heat energy that is lost when energy is converted from one form to another.

Horsepower - A unit of power equal to 746 watts.

Hydrocarbons - Molecules made up of hydrogen and carbon atoms in various proportions, usually formed by living things.

Hydroelectric Plant - An electric power plant in which electricity is generated by using the energy of falling water to turn turbines.

Indirect Energy - Any form of energy used to provide goods and services, which themselves may or may not use energy.

Joule - A unit of energy or work; the amount produced by a force of one newton operating through the distance of one meter, named after its inventor.

Kerosene - A fuel used in jet engines and gas turbines, made up of a mixture of hydrocarbons by "cracking" crude oil in a refinery. Its hydrocarbons are heavier than those in gasoline or naphtha.

Kilowatt - A unit of electric power equal to 1000 watts.

Kilowatt-hour - A unit of energy or work equal to the use of one kilowatt of energy for one hour.

Kinetic Energy - The energy of motion; the ability of an object to do work because of its motion.

Laser - A device which can produce high intensity radiation by forcing the atoms or molecules in a material to radiate at the same time, rather than independently, as in a light bulb.

Light - Electromagnetic radiation which can affect the eye.

Light Water Reactor - A nuclear reactor in which water is the primary coolant or moderator.

Liquified Natural Gas (LNG) - Natural gas that has been turned to a liquid by cooling it to minus 160 degrees Celsius, thus reducing its volume and making it easier and cheaper, and probably more dangerous, to store and ship.

Machine - A device which uses energy to do work.

Mechanical Energy - A form of energy which is seen as the motion of an object.

Megawatt - A unit of power equal to 1000 kilowatts or one million watts.

Moderator - The material (water, graphite, etc.) used in a nuclear reactor to control the rate of fission.

Natural Gas - A natural mixture of hydrocarbons found in porous rocks under the earth's surface, usually in association with petroleum. It is almost pure methane.

Non-renewable - Not able to be replaced once used up, as oil.

Nuclear Energy - Atomic energy, the energy released by changes in the nucleus of an atom in a reactor.

Nucleus - The dense, positively charged core of an atom.

Off-peak Power - Power generated during a period of low demand.

Oil Shale - A sedimentary rock containing the material kerogen, which can be recovered as oil when the rock is heated at high temperatures.

Particulates - Small ash and soot particles produced in burning.

Peak Load - The maximum amount of power which a plant can produce in a given period of time.

Petrochemicals - Chemicals derived from petroleum.

Petroleum - An oily, flammable liquid mixture of hydrocarbons that may vary from almost colorless to black, found in sedimentary rocks, and providing the raw material for a host of fuels and synthetic materials.

Photosynthesis - The process by which green plants convert the radiant energy of the sun into chemical potential energy when carbon dioxide and water are converted into carbohydrates.

Photovoltaic Process - The process by which radiant energy is converted directly into electric energy.

Pollution - Contamination or fouling of land, air, or water, by chemicals, heat, noise, atomic radiation, or wastes.

Potential Energy - Stored energy, as in a battery or water behind a dam.

Power - The rate at which energy is used or work is done, measured in units of energy per unit of time (calories per second) or in units such as kilowatts or horsepower.

Primary Energy - Energy in its natural form, such as coal or oil, before its conversion to end-use forms of energy, such as heat or electricity.

Radiation - The emission of energy through matter or space.

Reserves - Portions of a resource, such as oil, which have been discovered and can be extracted by available technology.

Resource - A product of nature which people use to satisfy their needs, wants, and dreams.

Second Law of Thermodynamics - In any energy conversion, some energy passed from a useful to a less useful form, usually lost heat, or "heat tax."

Smog - An atmospheric condition in which the air is polluted by smoke, fog, sulphur and nitrous oxides. Sulphur oxides react with water to form sulphuric acid droplets, which fall as "acid rain," causing great damage to marble and limestone buildings and statues, and to bodies of water which become too acidic to support living things.

Solar Cell - A device which converts solar radiant energy directly into electric energy by the photovoltaic process.

Solar Collector - A device for collecting solar energy and converting it into heat.

Solar Energy - The electromagnetic radiation transmitted by the sun. The earth receives about 4000 trillion kilowatt-hours per day.

Synthetic Natural Gas (SNG) - A gaseous fuel manufactured from coal, containing almost pure methane.

Tar Sand - A sandy geologic deposit in which oil is found.

Temperature - The "hotness" or "coldness" of a substance.

Thermal Pollution - Any increase in air or water temperature by waste heat from electric generating plants, which causes disturbances in the ecological system of an area.

Turbine - A motor turned by a powerful stream of water or gas.

Uranium - A radioactive, metallic element used as a fuel in nuclear power plant reactors to generate electricity.

Utility - A company or organization which provides services for people, such as gas, oil, or electricity.

Volt - The electromotive force which will cause a current of one ampere to flow through a resistance of one ohm.

Watt - A metric unit of power used in electric measurements of the rate at which work is done or energy used. One watt equals one Joule of work per second.

Work - The product of a force multiplied by the distance the force is applied or the object is moved.

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REVIEW SHEET (K-3)

This teachers' guide, Energy and My Environment (K-3), is for your review, field testing and comments. Your evaluation of these lessons will be sincerely appreciated and your suggestions considered for inclusion in a revised publication.

Sections of Guide Taught

Grade ___ Unit ___ Lesson ___ Grade ___ Unit ___ Lesson ___

Grade ___ Unit ___ Lesson ___ Grade ___ Unit ___ Lesson ___

Grade ___ Unit ___ Lesson ___ Grade ___ Unit ___ Lesson ___

Are lessons appropriate for grade level? ____________________

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Describe reaction of students. ____________________

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Is there sufficient emphasis on teaching energy facts? ____________

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Is there sufficient emphasis on teaching values? ____________

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Your ideas for extending the lessons:

Grade ___ Unit ___ Lesson ___ ____________________

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Grade ___ Unit ___ Lesson ___ ____________________

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Grade ___ Unit ___ Lesson ___ ____________________

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Please put additional ideas on back of review sheet; include the grade, unit and lesson numbers.

Other comments and suggestions: ____________________

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